BRITISH COLUMBIA
MINISTRY OF FORESTS AND RANGE

Okanagan Timber Supply Area

Rationale for Allowable Annual Cut (AAC) Determination

Effective January 1, 2006

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106-06357/

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Objective of this Document

This document is intended to provide an accounting of the factors I have considered and the rationale I have employed as chief forester of British Columbia (BC) in making my determination, under Section 8 of the *Forest Act*, of the allowable annual cut (AAC) for the Okanagan timber supply area (TSA). This document also identifies where new or better information is needed for incorporation in future determinations.

Description of the Okanagan Timber Supply Area

The Okanagan TSA, approximately 2.2 million hectares in total area, is administered from the BC Forest Service (BCFS) Okanagan Shuswap Forest District office in Vernon, along with field offices in Penticton and Salmon Arm. The Okanagan TSA is one of fifteen TSAs lying within the Southern Interior Forest Region of BC.

The TSA is about 320 kilometres long and 140 kilometres wide, stretching from Seymour River/Shuswap Lake in the north to the Canada/US border in the south, and from the Monashee Mountains in the east to the Okanagan Mountains in the west. The interaction of climate and terrain results in a wide range of vegetation, from wet-belt forests in the north to dry-belt forests and semi-arid grasslands in the south.

Approximately 348,000 people live in the TSA with about 55% of the population residing in the major communities of Kelowna, Vernon, Penticton and Salmon Arm. The TSA is one of the fastest-growing areas of the province with an estimated 14% population increase from 1996 to 2004.

Eleven First Nations bands reside in, or have asserted traditional territories within, the Okanagan TSA with a total population of approximately 7300. Four bands (Adams Lake, Neskonlith, Little Shuswap and Spallumcheen) belong to the Shuswap Nation Tribal Council. Seven bands (Lower Similkameen, Upper Similkameen, Osoyoos, Penticton, Westbank, Okanagan and Upper Nicola) are affiliated with the Okanagan Nation Alliance. The Upper Nicola band is also part of the Nicola Tribal Association.

The forests of the Okanagan TSA are very diverse and provide a wide range of resources including timber, forage, fisheries, wildlife, scenic landscapes, recreation opportunities, and water.

Common tree species include lodgepole pine, Douglas-fir, spruce, subalpine fir (balsam), western redcedar, western hemlock and larch, while white pine, yellow pine, ponderosa pine, larch, aspen, birch and cottonwood also occur.

The Okanagan TSA supports a diversity of habitats for fish and wildlife including a number of species at risk that are associated with forested ecosystems. These include bull trout, rubber boa, mountain caribou, northern goshawk, grizzly bear, fisher and mountain goat.

Residents and tourists enjoy outdoor recreation activities such as skiing, snowmobiling, biking, hiking, camping, fishing and hunting.

Critical issue: Epidemic mountain pine beetle infestation

Mountain pine beetle epidemics are natural events, however, the current infestation has reached an unprecedented level in BC's history. Provincial annual aerial survey data shows the beetle affected about 7 million hectares in 2004. Of the total area affected, 11% sustained severe mortality, 26% moderate mortality and 63% light or trace mortality. Early estimates indicate that the total area affected in 2005 has increased to about 8.5 million hectares.

While the forests of the Okanagan TSA have more species diversity than many areas affected by the epidemic, pine still represents 57 million cubic metres or 29% of the total volume within the timber harvesting land base. The majority of this pine volume, about 55 million cubic metres, is mature or over mature (>60 years old) and susceptible to the emerging beetle epidemic in the TSA.

In 2003, the aerial forest health survey of the Okanagan TSA indicated 10 500 hectares of mountain pine beetle infestation. The 2004 aerial survey indicated an unprecedented increase in beetle populations despite existing management strategies to combat the beetle with close to 44 000 hectares affected. Preliminary results from the 2005 aerial survey indicate about 78 000 hectares affected.

If beetle populations continue to expand as predicted in recent modeling work by the Ministry of Forests and Range, there could be as much as 50 million cubic metres of pine volume in stands under attack by 2010 of which 21 million cubic metres will be dead. While the total volume in stands under attack does not increase significantly by 2015 based on model projections, mortality significantly increases to 37 million cubic metres.

The mountain pine beetle epidemic is at the early stage of rapid expansion so intervention may mitigate the economic and environmental impacts. For this reason, this urgent review of the timber supply and AAC in the Okanagan TSA has been conducted.

Expedited process for an urgent AAC determination to address the infestation

The Okanagan Shuswap Forest District's *Mountain Pine Beetle Management Strategy's* goals include taking all reasonable actions to reduce bark beetle incidence to the level where all new infestations are adequately addressed prior to the next beetle flight following discovery. The strategy's other goal is to reduce the negative impacts of beetle infestations and salvage operations on biodiversity and other forest values. Through aggressive removal of beetle brood it is hoped that mature pine mortality will be slowed and the window to harvest susceptible stands will be extended. While susceptible lodgepole pine stands will likely become infested regardless of management efforts, slowing the outbreak will allow for improved planning and more orderly harvesting of mature pine stands while reducing the threat to immature pine stands.

A significant portion of the current AAC is dedicated to harvesting infested or susceptible stands in support of the district's strategy. Even so, without an increased harvest level, current efforts are believed insufficient to address the epidemic. There is an opportunity to increase the harvest of currently infested and susceptible stands to slow the spread of

the epidemic provided prompt action is taken. This includes providing a timely AAC determination.

In contemplation of the need to provide remedies for these and similar situations, the *Forest Act* (section 8(8)(e)) requires the chief forester, in determining AACs, to consider *abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area.*

In November 2004, the Okanagan Shuswap Forest District Manager requested an urgent review of the timber supply in the Okanagan TSA and consideration of an AAC uplift in order to help implement the district's strategy. The request to urgently consider an uplift was in response to the need for timely and aggressive harvesting intervention of infested and susceptible (high risk) stands at the early stages of the epidemic in order to slow the expected expansion of mountain pine beetles before the beetle flight in 2006.

In response to the need to address the current mountain pine beetle infestation for the Okanagan TSA, an expedited review process was undertaken. This included: an assessment of the epidemic and how it can be addressed by BCFS staff, sensitivity analyses associated with different AAC uplift and beetle expansion scenarios, First Nations consultation and a public discussion paper distributed in July 2005 where comments were solicited and received.

Having considered the rapid increase in the mountain pine beetle population in the Okanagan TSA, as well as the proximity of the infestation to a large area of the beetle's preferred host – mature lodgepole pine – and the potential effects of the infestation on the standing timber inventory, on future timber supply and on other values in the TSA, I became satisfied that the epidemic indeed poses an immediate and severe risk to the TSA. Having reviewed the information about the current epidemic, I became further satisfied that an early AAC determination, with particular weight given to considerations under section 8(8)(e) of the *Forest Act*, could be crucial assistance in remedying some of the serious problems related to the mountain pine beetle infestation.

On this basis, I have proceeded to make such a determination in as timely a manner as possible, giving consideration to all the land use, forest growth, forest management, social and economic and other factors required by the statute to be considered. This rationale describes my considerations and reasoning on which my determination is based.

I am indebted to BCFS staff in the Okanagan Shuswap Forest District, the Southern Interior Forest Region, and the Forest Analysis and Inventory Branch for their professional dedication, under pressure in this abbreviated process, to maintaining the high standards of investigation and presentation that have helped me to make a determination which I am confident is supported by the best available information. I am also indebted to the Okanagan Innovative Forestry Society for their 2002 timber supply analysis which was used as the base case in this expedited determination, and to the organizations, individuals and First Nations who contributed significant insights during the review process. I have taken all this information into account in my determination.

History of the AAC

The allowable annual cut (AAC) for the Okanagan TSA from 1980 to 1986 was 2 700 000 cubic metres. Between 1987 and 1993, temporary increases to harvest timber affected by mountain pine beetle infestations was authorized, with the AAC varying from 2 804 000 to 3 200 000 cubic metres. From 1994 to 2000, with the removal of the uplift, the AAC was set at 2 615 000 cubic metres. In the last AAC determination in 2001, the AAC was set at 2 655 000 cubic metres which included an 80 000 cubic metre partition for small-scale salvage. The Minister apportioned the AAC as follows:

Apportionment	Cubic metres per year	Percentage
Replaceable Forest Licences	2 138 867	80.6
Non-replaceable Forest Licences	15 000	0.6
Replaceable Timber Sale Licenses	35 264	1.3
BC Timber Sales	343 119	12.9
Woodlot Licences	17 000	0.6
Forest Service Reserve	105 750	4.0
Total AAC	**2 655 000**	**100.0**

New AAC determination

Effective January 1, 2006, in response to the need for an emergency forest management strategy in response to the mountain pine beetle epidemic, the new AAC for the Okanagan TSA will be 3 375 000 cubic metres. This represents a 720 000 cubic metre increase from the previous AAC and includes continuation of the 80 000 cubic metre partition for small scale salvage and a new 20 000 cubic metre partition for the harvest of deciduous species. This volume excludes all volumes allocated to woodlot licences. This AAC will remain in effect until a new AAC is determined, which must take place within five years of the present determination.

Information sources used in the AAC determination

The Okanagan Innovative Forestry Society (OIFS) hired Timberline Forest Inventory Consultants Ltd to prepare a timber supply analysis to support their application for an AAC uplift under their Innovative Forestry Practices Agreements (IFPAs). Due to the urgency of the mountain pine beetle epidemic in the TSA, this 2002 analysis was used to help support this determination.

Numerous information sources used to support this determination are documented in:

- *Urgent Timber Supply Review for the Okanagan Timber Supply Area: Technical Summary for the Allowable Cut Determination Meeting, September 21-22, 2005.* 2005. Okanagan Shuswap Forest District.

Key information sources used in this determination include:

- *Application for an Allowable Annual Cut Increase for the Okanagan Innovative Forestry Practices Agreements (IFPAs): Forestry Plan Amendment.* 2003. Okanagan Innovative Forestry Society. This provides the 2002 timber supply analysis including the "uplift innovative composite scenario" that is used as the base case for this determination.
- *Urgent timber supply review for the Okanagan timber supply area: Public Discussion Paper.* July 2005. BC Ministry of Forests and Range;
- *Information Package – Okanagan Innovative Forestry Practices Agreement Allowable Annual Cut Uplift Analysis.* Prepared for the Okanagan Innovative Forestry Society. Timberline Forest Inventory Consultants Ltd. 2002.
- *Analysis Report – Okanagan Innovative Forestry Practices Agreement Allowable Annual Cut Uplift Analysis.* Prepared for the Okanagan Innovative Forestry Society. Timberline Forest Inventory Consultants Ltd. 2002.
- *Okanagan Timber Supply Area Rationale for Allowable Annual Cut (AAC) Determination, Effective August 1, 2001.* 2001. Larry Pedersen, Chief Forester;
- *Okanagan TSA Analysis Report and Public Discussion Paper.* 2000. BC Forest Service. (referred to as "2000 timber supply analysis" in this determination).
- Affidavit between Province of BC and representatives of Adams Lake Band, Spallumcheen Indian Band, Neskonlith Indian Band and Okanagan Indian Band, February 21, 2005, and related affidavit from Dr. Douglas Hudson, October 26, 1999;
- Letter from the Minister of Forests to the chief forester, dated July 28, 1994, stating the Crown's economic and social objectives for the province (see Appendix 3);
- Memorandum from the Minister of Forests to the chief forester, dated February 26, 1996, stating the Crown's economic and social objectives for the province regarding visual resources (see Appendix 4);
- *Forest and Range Practices Act*, 2002 and amendments;
- *Forest and Range Practices Regulations*, 2004 and amendments;
- *Forest Practices Code of British Columbia Act*, 1995, and amendments;
- *Forest Practices Code of British Columbia Act Regulations*, 1995, and amendments;
- *Forest Practices Code of British Columbia* Guidebooks, BCFS and MELP;
- Technical review and evaluation of current and expected operating conditions through comprehensive discussions with BCFS staff, including the AAC determination meeting held in the Okanagan Shuswap Forest District office on September 21-22, 2005 and a helicopter review of portions of the TSA on September 21, 2005 with district staff.

Role and limitations of the technical information used

Section 8 of the *Forest Act* requires the chief forester, in determining AACs, to consider biophysical, social and economic information. Most of the technical information used in determinations is in the form of a timber supply analysis and its inputs of inventory and growth and yield data. These are concerned primarily with biophysical factors—such as the rate of timber growth and the definition of the land base considered available for timber harvesting—and with management practices.

The computerised analytical models currently used to assess timber supply purposely simplify the real world and unavoidably involve uncertainty in many of the inputs, due in part to variations in physical, biological and social conditions. While ongoing science-based improvements in the understanding of ecological dynamics will help reduce some of these uncertainties, technical information and analytical methods alone cannot incorporate all the social, cultural and economic factors relevant to forest management decisions, nor do they necessarily provide complete answers or solutions to the forest management problems addressed in AAC determinations. However, they do provide valuable insight into potential outcomes of different resource-use assumptions and actions—important components of the information that must be considered in AAC determinations.

In determining the AAC for the Okanagan TSA I have considered and discussed known limitations of the technical information provided, and I am satisfied that the information provides a suitable basis for my determination.

Statutory framework

Section 8 of the *Forest Act* requires the chief forester to consider a number of specified factors in determining AACs for timber supply areas and tree farm licences. Section 8 is reproduced in full as Appendix 1 of this document.

Guiding principles for AAC determinations

Rapid changes in social values and in the understanding and management of complex forest ecosystems mean there is always uncertainty in the information used in AAC determinations. In making the large number of periodic determinations required for British Columbia's many forest management units, administrative fairness requires a reasonable degree of consistency of approach in incorporating these changes and uncertainties. To make my approach in these matters explicit, I have set out the following body of guiding principles. In any specific circumstance where I may consider it necessary to deviate from these principles, I will explain my reasoning in detail.

Two important ways of dealing with uncertainty are

(i) minimizing risk, in respect of which in making AAC determinations I consider particular uncertainties associated with the information before me and attempt to assess and address the various potential current and future, social, economic and environmental risks associated with a range of possible AACs; and

(ii) redetermining AACs frequently, in cases where projections of short-term timber supply are not stable, to ensure they incorporate current information and knowledge—a principle that has been recognized in the legislated requirement to redetermine these AACs every five years. This principle is central to many of the guiding principles that follow.

In considering the various factors that Section 8 of the *Forest Act* requires the chief forester to take into account in determining AACs I attempt to reflect, as closely as possible, operability and forest management factors that are a reasonable extrapolation from current practices. It is not appropriate to base my decision on unsupported

speculation with respect to factors that could work to *increase* the timber supply—such as optimistic assumptions about harvesting in unconventional areas, or using unconventional technology, that are not substantiated by demonstrated performance—or with respect to factors that could work to *reduce* the timber supply, such as integrated resource management objectives beyond those articulated in current planning guidelines or the Forest Practices Code—'the Code'—which is now in transition to the Province's *Forest and Range Practices Act*.

In many areas the timber supply implications of some legislative provisions, such as those for landscape-level biodiversity, remain uncertain, particularly when considered in combination with other factors. In each AAC determination I take this uncertainty into account to the extent possible in context of the best available information.

As British Columbia progresses toward the completion of strategic land-use plans, in some cases the eventual timber supply impacts associated with land-use decisions resulting from various regional and sub-regional planning processes remain subject to some uncertainty before formal approval by government. It is my practice not to speculate on timber supply impacts that may eventually result from land-use decisions not yet finalized by government.

In some cases, even when government has made a formal land-use decision, it is not necessarily possible to fully analyze and account for the consequent timber supply impacts in a current AAC determination. Many government land-use decisions must be followed by detailed implementation decisions requiring for instance the establishment of resource management zones and resource management objectives and strategies for those zones. Until such implementation decisions are made it would be impossible to fully assess the overall impacts of the land-use decision. In such cases the legislated requirement for frequent AAC reviews will ensure that future determinations address ongoing plan-implementation decisions. Wherever specific protected areas have been designated by legislation or by order in council, these areas are deducted from the timber harvesting land base and are not considered to contribute any harvestable volume to the timber supply in AAC determinations, although they may contribute indirectly by providing forest cover to help in meeting resource management objectives such as for biodiversity.

In the Okanagan TSA, government approved the Okanagan Shuswap Land and Resource Management Plan (OS-LRMP) in 2001 which has clarified many aspects of land and resource management and I refer to this where applicable in various components of this document.

Where appropriate, I will consider information on the types and extent of planned and implemented silviculture practices as well as relevant scientific, empirical and analytical evidence on the likely magnitude and timing of their timber supply effects.

Some have suggested that, given the large uncertainties present with respect to much of the data in AAC determinations, any adjustments in AAC should wait until better data are available. I agree that some data are not complete, but this will always be true where information is constantly evolving and management issues are changing. Moreover, in the past, waiting for improved data created the extensive delays that resulted in the

urgency to redetermine many outdated AACs between 1992 and 1996. In any case, the data and models available today are superior to those available in the past, and will undoubtedly provide for more reliable determinations.

Others have suggested that, in view of data uncertainties, I should immediately reduce some AACs in the interest of caution. However, any AAC determination I make must be the result of applying my judgement to the available information, taking any uncertainties into account. Given the large impacts that AAC determinations can have on communities, no responsible AAC determination can be made solely on the basis of a response to uncertainty. Nevertheless, in making my determination, I may need to make allowances for risks that arise because of uncertainty.

With respect to First Nations' issues, I am aware of the Crown's legal obligations resulting from decisions in recent years in the Supreme Court of Canada. The AAC that I determine should not be construed as limiting the Crown's obligations under these decisions in any way, and in this respect it should be noted that my determination does not prescribe a particular plan of harvesting activity within the Okanagan TSA. It is also independent of any decision by the Minister of Forests and Range with respect to subsequent allocation of the wood supply. I consider those aboriginal interests raised during the consultation process associated with timber supply review. As I am able, within the scope of my authority under section 8 of the *Forest Act,* I address those interests. When aboriginal interests are raised that are outside of my jurisdiction, I will endeavour to forward these interests for consideration to other decision-makers.

Overall, in making AAC determinations, I am mindful of my obligation as steward of the forest land of British Columbia, of the mandate of the Ministry of Forests and Range as set out in Section 4 of the *Ministry of Forests Act*, and of my responsibilities under the Code and under the *Forest and Range Practices Act*.

Because the new regulations of the *Forest and Range Practices Act* are designed to maintain the integrity of British Columbia's forest stewardship under responsible forest practices, it is not expected that the implementation of the legislative changes will significantly affect current timber supply projections made using the Code as a basis for definition of current practice.

The role of the base case

In considering the factors required under Section 8 of the *Forest Act* to be addressed in AAC determinations, I am assisted by timber supply forecasts provided to me through the work of the Timber Supply Review program for TSAs and TFLs.

For each AAC determination for a TSA a timber supply analysis is carried out using an information package including data and information from three categories—land base inventory, timber growth and yield, and management practices. Using this set of data and a computer simulation model, Timberline's Critical Analysis of Schedules for Harvesting – version 6 (CASH6) for the Okanagan TSA, a series of timber supply forecasts can be produced, reflecting different decline rates, starting harvest levels, and potential trade-offs between short- and long-term harvest levels.

From a range of possible forecasts, one is chosen in which an attempt is made to avoid both excessive changes from decade to decade and significant timber shortages in the future, while ensuring the long-term productivity of forestlands. This is known as the 'base case' forecast, and forms the basis for comparison when assessing the effects of uncertainty on timber supply. The base case is designed to reflect current management practices. The base case forecast for this timber supply review is the "uplift innovative composite scenario" in the 2002 timber supply analysis conducted by Timberline on behalf of the Okanagan Innovative Forestry Society (OIFS).

Because the base case represents only one in a number of theoretical forecasts, and because it incorporates information about which there may be some uncertainty, the base case forecast for a TSA is not an AAC recommendation. Rat' :r, it is one possible forecast of timber supply, whose validity—as with all the other forecasts provided—depends on the validity of the data and assumptions incorporated into the computer simulation used to generate it.

Therefore, much of what follows in the considerations outlined below is an examination of the degree to which all the assumptions made in generating the base case forecast are realistic and current, and the degree to which any adjustments to its predictions of timber supply must be made, if necessary, to more properly reflect the current situation.

Such adjustments are made on the basis of informed judgement using current available information about forest management that may well have changed since the original information package was assembled. Forest management data is particularly subject to change during periods of legislative or regulatory change, or during the implementation of new policies, procedures, guidelines or plans. Thus it is important to remember that while the timber supply analysis with which I am provided is integral to the considerations leading to the AAC determination, the AAC is not determined by calculation but by a synthesis of judgement and analysis in which numerous risks and uncertainties must be weighed. Depending upon the outcome of these considerations, the resulting AAC may or may not coincide with the base case forecast. Moreover, because some of the risks and uncertainties considered are qualitative in nature, once an AAC has been determined, further computer analysis of the combined considerations may not confirm or add precision to the AAC.

Base case for the Okanagan TSA

The base case in the 2002 timber supply analysis that is used in this timber supply review incorporates a number of changes in input data and methodology from the base case generated in the 2000 timber supply analysis that supported the previous AAC determination effective August 1, 2001. These differences include the use of:

- inventory adjustments based on Vegetation Resource Inventory (VRI) Phase 2 sampling;
- new site index estimates for managed stands in the wet-belt and dry-belt areas;
- refined analysis units based on wet-belt/dry-belt differences;
- assumptions that reflect current Okanagan Shuswap Land and Resource Management Plan (OS-LRMP) direction and implementation;

- current estimates regarding use of genetic gain from planting stock; and
- use of Timberline's CASH6 simulation model which spatially models timber supply for the first 30 years.

Due to these and other changes, the current and previous base case projections are not directly comparable in some respects. Comprehensive details of the assumptions made in representing current forest management in the Okanagan TSA in the base case are provided in the 2002 timber supply analysis report and many are also discussed in relevant sections of this rationale.

In the base case, the harvest flow objectives included maintaining a relatively high initial harvest level for as many decades as possible with a gradual, controlled decline in harvest levels if required to reflect forest management assumptions. The objectives also included achieving a maximum even-flow long-term supply where the growing stock is stable.

The resulting base case forecast indicates that the initial harvest level of 3 000 000 cubic metres can be maintained for 40 years. After that, harvest levels decline by approximately 8% per decade for two decades before reaching a mid-term harvest level of 2 555 000 cubic metres per year which can be maintained from decades 6 to 10. Harvest levels can then increase 15% in decade 11 to a sustained long-term level of 2 930 000 cubic metres.

From my review of the timber supply analysis, including detailed discussions with BCFS analysts, I see no reason why the base case forecast should not provide a suitable basis of reference for use in my considerations in this determination. In addition to the base case forecast, I was provided with a number of sensitivity analyses carried out using the base case as a reference. Mountain pine beetle-related harvest flow scenarios were also provided. All of these analyses, and others as noted below, have been helpful in the considerations and reasoning leading to my determination, which are documented as follows.

Consideration of Factors as Required by Section 8 of the *Forest Act*

Section 8 (8)

In determining an allowable annual cut under this section the chief forester, despite anything to the contrary in an agreement listed in section 12, must consider

(a) the rate of timber production that may be sustained on the area, taking into account

(i) the composition of the forest and its expected rate of growth on the area

Land base contributing to timber harvest

- general comments

The total general area of the Okanagan TSA is estimated to be 2 219 037 hectares with a total Crown-owned area of 1 869 323 hectares. Of the Crown area, approximately 400 799 hectares are considered non-forest, 7525 hectares are non-commercial brush, and 21 288 hectares are in existing roads, trails and landings. This leaves a total productive Crown forest area of 1 439 711 hectares within the TSA boundary. About 127 767 hectares of productive forest are in parks, ecological reserves and new protected areas associated with the OS-LRMP. The net Crown productive forestland base is therefore estimated to be 1 311 944 hectares (about 59% of total TSA area).

About 289 602 hectares (22 percent) of the net Crown productive forestland base within the TSA was assumed in the base case to be unavailable for timber harvesting in the timber supply analysis. The main reason that forests are unavailable is because they are considered to be inoperable, unmerchantable, too difficult to regenerate and/or necessary to retain for riparian management. The current area estimated in the base case to be economically and environmentally suitable for harvesting—the 'timber harvesting land base'—therefore covers 1 022 342 hectares (78 percent of the Crown productive forests).

Deriving the timber harvesting land base includes making a series of deductions from the productive forest land base to account for factors that effectively reduce the suitability or availability of the productive forest area for economic or ecological reasons. In timber supply analysis, assumptions, and if necessary, projections, must be made about these factors, prior to quantifying appropriate areas to be deducted from the productive forest area to derive the timber harvesting land base. A detailed accounting of the areas deducted is given in the 2002 timber supply analysis. My consideration of these deductions follows. The deductions provided for each factor below represent the total productive forest land area (referred to as "total area" below) in that it includes overlaps with other netdown factors.

- roads, trails and landings

In the analysis, separate estimates were made to reflect reductions to the timber harvesting land base already incurred by existing roads trails and landings, and those to be expected in the future. Reductions to the land base assumed in the 2002 timber supply

analysis for existing roads, trails and landings were similar to those used in the previous 2000 analysis (which was based on a BCFS TSA study). The 2002 analysis used a specified buffer width for highways, forest roads, and trails identified on TRIM maps to estimate losses to the land base. The estimated reductions, however, were thought to underestimate losses. Therefore the losses estimated by buffering roads and trails were proportionately increased to reflect the reductions assumed in the previous 2000 analysis, with a total area of 21 288 hectares deducted from the land base.

The base case assumptions for future roads, trails and landings were that 4.9% of all stands currently greater than 40 years of age would be reduced from the land base following projected harvest. This is the same as was assumed in the 2000 analysis. A 2002 study undertaken for the OIFS suggests that the losses due to future roads, trails and landings could be 4.1% - or 0.8% less than assumed in the base case; however this was not used by OIFS in the base case. This suggests there might be a small upward pressure on timber supply in the long term.

BCFS staff accept the modelling methods used in support of the base case, but also recommend that the assumptions used to estimate existing and future losses should be refined. I concur with this recommendation and encourage under "Implementation" that this work be completed before the next determination. In the meantime, I do not believe it is necessary to adjust the assumptions made in the base case for use in this determination.

- protected areas

The province's protected areas strategy has two goals. Goal 1 is to protect viable representative examples of the natural diversity of the province. Goal 2 is to protect special natural, cultural heritage and recreational features of the province that are not captured in Goal 1 areas.

The timber supply analysis deducted 127 767 hectares of total area from the timber harvesting land base to account for protected areas. This included 54 602 hectares for provincial parks and 4259 hectares of ecological reserves established prior to the Okanagan-Shuswap LRMP; and 66 219 hectares of Goal 1 protected areas and 2687 hectares of Goal 2 protected areas identified in the OS-LRMP.

The Goal 1 protected areas were established as parks or protected areas by Orders-in-Council in 2001. Ten of the Goal 2 areas were established as parks in 2004. Although eight Goal 2 areas have not yet been formally established as protected areas, they are expected to be designated given government's approval of the OS-LRMP; they also represent a very small portion of the timber harvesting land base so that any uncertainty in this factor would represent a negligible impact on timber supply.

I am therefore satisfied that the base case assumptions have adequately accounted for protected areas in defining the timber harvesting land base for the purposes of this determination.

- inoperable areas and unstable terrain

Those portions of the TSA which are not physically accessible for harvesting, or which are not feasible to harvest economically, are excluded in deriving the timber harvesting land base. Operability lines for the Okanagan TSA were developed in 1993, and updated in 1997 for the former Salmon Arm Forest District. At the same time, BC Forest Service and forest industry staff reviewed the operability lines for the TSA and some adjustments were made. The analysis reduced the land base by 118 530 hectares total area to reflect inoperability. These deductions were similar to those assumed in previous 2000 analysis.

Reductions based on inoperable areas included environmentally sensitive areas (ESAs) due to soil or terrain sensitivity that are mapped as Es in the forest cover inventory maps. More recent terrain stability mapping exists for over 60% of the TSA however this was not used instead of Es mapping. Terrain stability mapping is considered better information for identifying sensitive soil and terrain areas than the older Es mapping.

BCFS district confirmed that the operability mapping assumed in the base case is a reasonable reflection of current practices in the TSA. Should current economic factors that help define operability in the TSA change significantly in the future, there may be a need to re-visit current mapping in the future. For the purposes of this determination, I am satisfied that existing operability mapping is suitable for use in helping to define the timber harvesting land base.

I have noted under "Implementation" that prior to the next determination, current operability lines should be assessed relative to the more recent terrain stability mapping so that the lines can be confirmed or adjusted where warranted.

- unmerchantable and deciduous forest types

Unmerchantable (or problem) forest types are not expected to be economically utilizable due to low volumes or poor quality. The base case excluded coniferous-leading stands based on factors such as not achieving a minimum height at a given age. The criteria employed are more fully described in the timber supply analysis. All deciduous-leading stands were also excluded in the analysis since these are currently not utilized in the TSA. The total area excluded from the land based due to this factor as 77 903 hectares.

In 2000 a non-replaceable forest license was awarded as a pilot to demonstrate enhanced utlization of small-diameter pine stands that were assumed in the base case to be unmerchantable. There is some uncertainty about the criteria the defines problem forest types relative to the inventory label on forest cover maps so that the real extent to which small-diameter pine are in fact being utlized is not fully known. BCFS staff are trying to address this issue.

BCFS district staff believe, in general, that the criteria used in the timber supply analysis appropriately accounts for this factor. I accept the reductions made to address unmerchantable forest types for the purposes of this determination. There may be an upward pressure on timber supply that can be accounted for in future determinations if in fact there is greater harvesting of small diameter pine than assumed in the base case.

- regeneration problems

Environmentally sensitive area (ESA) mapping includes the identification of areas where regeneration may not be economically feasible due to adverse conditions – these are labelled as Ep. In the Okanagan TSA, these areas are at high elevations where the establishment of new stands is expected to be hindered by unpredictable and severe climate. Due to these harsh conditions, no harvesting is expected in Ep areas. As a consequence, all Ep areas in the TSA were entirely deducted from the land base – resulting in a 67 666 hectare reduction.

Other ESA categories are addressed in deductions for inoperable areas (e.g. unstable terrain) and other forest management objectives such as for wildlife discussed later.

BCFS district staff confirm that there has not been harvesting history in areas labelled Ep and believe the base case has adequately accounted for this factor. I concur that this factor has been appropriately addressed in the timber supply analysis.

- low productivity sites

Sites may have low productivity either because of inherent site factors (e.g. nutrient availability, exposure, excess moisture) or stand factors (e.g. non-commercial species). Low productivity stand types that were not considered harvestable were excluded from the timber harvesting land base. Sites with low timber growing potential were identified in the analysis based on forest type and minimum site index. A total area of 28 455 hectares were deducted from the land base to account for this factor.

BCFS district staff reviewed the projected age class of low sites and found only 167 hectares to have an age class 0 or 1 (which could be due to fire or harvesting). This suggests that there has in fact been virtually no harvesting history in these low productivity sites, and that excluding these sites from the base case is warranted. I therefore accept the deductions made to account for this factor for the purposes of this determination.

- riparian management

Riparian areas along streams, lakes and wetlands provide key habitat for fish and wildlife and help conserve water quality and biodiversity. The Forest Practices Code (Code) and the *Forest and Range Practices Act* (FRPA) provide for riparian reserve zones (RRZs) that exclude timber harvesting and riparian management zones (RMZs) that can help guide timber harvesting in order to protect riparian habitats.

In the timber supply analysis, in order to emulate expected timber supply impacts from riparian reserves under FRPA, considering the Riparian Management Area Guidebook, a 12.4 metre weighted average reserve width was applied to all TRIM mapped streams in the Okanagan TSA. Reserve widths for different classes of lakes and wetlands were as specified in the Guidebook. The total reserve for streams, lakes and wetlands was estimated to be 52 667 hectares and this total area was deducted from the timber harvesting land base in the base case.

In addition to Code (now FRPA) requirements for riparian management, the OS-LRMP provides for additional enhanced riparian reserves. Current management is following the OS-LRMP recommendation and enhanced reserves are in the process of being established. Until these reserves are established, the timber supply analysis accounted for enhanced reserves by proportionally reducing the timber harvesting land base for each polygon within the TSA. This resulted in an additional 12 669 hectare total area reduction from the land base.

Comments received noted that a proportional reduction within a polygon may not have fully accounted for the timber supply impact of enhanced riparian reserves since they likely would be placed adjacent to small S4 and S5 streams that likely have higher forest productivity than average forests within a polygon.

I accept that there may be some uncertainty in accounting for enhanced riparian reserves, but this uncertainty should only have a minor effect on the timber supply in the TSA and therefore poses small risk to this determination. This factor can be better accounted for in the next timber supply analysis when enhanced reserves are actually established. In the meantime, I accept the assumptions made to account for riparian management in the base case as appropriate for use in support of this determination.

- archaeological and cultural heritage resources

Archaeological and cultural heritage resources include archaeological sites and traditional uses of the land by First Nations. To assist in identifying these resources, an archaeological overview assessment was completed in the TSA and traditional use studies have been undertaken in portions of the Okanagan TSA. 956 archaeological sites protected under the *Heritage Conservation Act* have been identified in the TSA of which 37 sites were in the timber harvesting land base covering a total area of 11 hectares. This relatively small area (in context of timber supply review of an entire TSA) was not excluded from the land base in the base case.

The Neskonlith, Adams Lake and Little Shuswap traditional use studies collectively identified about 11 693 hectares of productive forest with spiritual values (often called sacred areas) to First Nations. This includes about 3000 hectares of productive forest area on Mt. Ida where forest harvesting is being conducted to a limited extent in order to address these values. The BC Forest Service and the Neskonlith and Adams Lake Bands have entered into a process agreement for forest activities on Mt. Ida. It is uncertain whether forest harvesting in some of this area can be done in a manner that respects its spiritual values. These areas were included in the base case.

About 70% of the TSA's productive forests are in the timber harvesting land base. If this percent were to apply to the estimated 11 693 hectares of sacred areas, that would represent about 8200 hectares which represents about 0.8% of the overall timber harvesting land base.

Comments from First Nations included concerns about how traditional use study information are being considered in AAC determinations and that sacred areas like Mt. Ida should be removed from the timber harvesting land base. Concern was also

expressed that there are large information gaps about First Nations cultural heritage resources and traditional practices.

Portions of the Okanagan TSA are subject to current litigation involving several Bands and the province. I am aware of aboriginal interests and uses asserted in the affidavits and which are relevant to this litigation, including the use of trees for various cultural purposes. I do not believe this AAC determination will impact these asserted interests and uses. For example, First Nations can apply for a free use permit under the *Forest Act* for the use of trees for cultural and traditional purposes.

Given the limited harvesting in asserted spiritual areas, and in relation to archaeological sites, I recognize in my "Reasons for Decision" an uncertain downward pressure on timber supply relative to the base case which is expected to be less than 0.8% based on current information. For the purposes of tracking cumulative pressures on timber supply, I assume roughly a 14 000 cubic metre downward pressure throughout the harvest forecast.

I am also mindful that improved information may result in revisions to future practices relative to those modelled in the analysis. When funding is available, I encourage completion of traditional use studies in the TSA so that this information can be factored into subsequent timber supply analyses. Future determinations can account for any changes in forest practices that are needed to address archaeological and aboriginal interests information.

- timber licence reversions

Timber licences (TLs) are old tenure arrangements that give a licensee exclusive rights to harvest merchantable timber within the licence area for a specified period of time and therefore do not contribute to the AAC. Once these areas have been harvested, all future harvesting rights revert to the Crown and future harvests from the area will then contribute to the harvest for the TSA which contains the TL area.

There are a total of 18 870 hectares of TLs within the Okanagan TSA which represents about 9174 hectares of timber harvest land base. The land base estimate excludes protected areas identified under the LRMP as previously discussed. A schedule was developed for the timber supply analysis that estimated when TL areas would be harvested and reverted back to the TSA land base until the expiry of the TLs in 2030.

There is some uncertainty around a few hundred hectares of proposed protected areas that occurs within TLs related to issues such as compensation. This uncertainty however relates to a very small portion of the potential long-term land base and therefore poses virtually no risk to short-term timber supply.

Notwithstanding this concern, BCFS staff conclude that the analysis reasonably reflects expected reversions, and I am satisfied that this factor was appropriately accounted for in the base case projection.

- woodlot licences

The *Forest Act* requires AACs determined for TSAs to be exclusive of the areas and timber volumes allocated to woodlot licences. When woodlot licences are issued from a TSA, the required volumes are first allocated from an appropriate apportionment under the AAC for the TSA. Then, in the next AAC determination for the TSA, the TSA land base is reduced by the area of Crown land in all the woodlot licences issued since the previous determination, and the total volume in the issued woodlot licences is excluded from contributing to the AAC for the TSA.

Most of the existing woodlots in the TSA area are not included in timber harvesting land base. Recently established woodlots and additions to existing woodlots representing 13 016 cubic metres of the TSA's annual harvest volume were, however, included in the base case. Additional woodlots representing about 9000 cubic metres of annual harvest volume have also been committed and are under active development.

The new and committed woodlot volumes total 22 016 cubic metres which I recognize in my "Reasons for Decision" as a small downward pressure on timber supply.

BCFS staff also note that there are also proposals for additional woodlots. For this determination, in keeping with my guiding principles, I will not speculate on allocation decisions that have not yet been made. Once the amount of area being added to woodlots is approved, it can be accounted for in the next determination.

- community forests

The Westbank First Nation was awarded in 2004 an approximately 45 693-hectare community forest with an estimated annual harvest volume of 55 000 cubic metres. As with woodlots, the TSA land base is reduced by the area of Crown land in community forests. Since the timber supply analysis was carried out in 2002, this deduction was not made.

As discussed below under *existing forest inventory* there is strong evidence that the timber volume in existing stands are under-estimated by about 7 percent. I therefore recognize in my "Reasons for Decision" a downward pressure of 58 850 (55 000 x 1.07) cubic metres relative to the base case to account for this community forest. BCFS staff note that the existing community forest license is probationary and also that there is interest to establish additional community forests. In keeping with my guiding principles, as future decisions are made regarding community forests, they can be factored into subsequent determinations.

- controlled recreation areas

Implementation of BC's all-season resort strategy involves the established of controlled recreation areas (CRAs) on Crown lands were resort activities are greatest. The intent is to remove CRAs from the TSA to enable resort owners to have more control over harvesting so that any activity is undertaken in a manner that supports the resort. For example, this could mean not restocking harvested areas if needed to support a ski run.

CRA negotiations are active but no decisions have been made to remove areas from the TSA. As a consequence, in keeping with my guiding principles, I will not speculate in this determination on land use decisions that have not yet been completed. I understand that the areas involved represent less than 1% of the timber harvesting land base, therefore any uncertainty in this factor should not pose a significant risk to timber supply given the size of the area involved. Under "Implementation", I request that decisions regarding CRAs be tracked so that they can be factored into subsequent determinations.

Existing forest inventory

The Okanagan TSA forest inventory is one of the oldest inventories in the province. The original inventory work was conducted between 1963 and 1979 with a depletion update to 2000/2001 to account for forest harvesting. The age of the inventory has led to uncertainty about the volumes and species composition described in the inventory relative to what may actually occur on-the-ground. The BCFS conducted an inventory audit in 1997 and concluded that there were no significant differences between audit and inventory volumes for mature stands.

Vegetation Resource Inventory (VRI) is the current approach for improving the forest inventory. VRI generally consists of two phases: phase 1 based on photo interpretation, and phase 2 consisting of ground sampling (which can occur prior to phase 1 work). In 2002, the Okanagan Innovative Forestry Society (OIFS) carried out a phase 2 project as part of its Innovative Forestry Practices Agreements (IFPAs). The phase 2 project, whose sampling design was approved by government inventory staff, involved greater ground sampling (i.e. 110 sample plots) than occurred in the earlier inventory audit.

The VRI phase 2 work indicates that the forest inventory underestimated timber volumes on the Crown forested land base by 10% and volumes on the timber harvesting land base by 7%. The 7% underestimation is an overall average; different stand types in fact varied considerably. For example, the inventory appeared to underestimate volumes for younger stands, but overestimate volumes for older stands.

A standard procedure exists, called the Fraser Protocol, to adjust the forest inventory based on phase 2 ground samples. The OIFS felt that problems existed with the adjustments using the protocol and therefore choose instead to increase all natural stand yield tables by a constant 7% based on phase 2 findings and this approach is reflected in the timber supply analysis and the base case. The 7% volume gain enabled the base case to have an increased harvest flow of 345 000 cubic metres per year in the first 4 decades (i.e. 3 000 000 cubic metres in base case versus current AAC of 2 655 000 cubic metres).

Some public comments questioned or raised uncertainties about the adjustments made to inventory volumes based on the phase 2 work.

Although BCFS inventory staff note that the methodology employed in the timber supply analysis to adjust inventory volumes has significant issues when applied to individual forest cover polygons, they accepted its overall use as suitable for this timber supply review in the context of estimating TSA-wide harvest flows. The problems encountered using the standard procedure (the Fraser Protocol) for adjusting inventory attributes

based on the phase 2 ground samples needs to be reconciled so that the existing standard can be used to adjust inventory volumes.

A sensitivity analysis was undertaken to determine the harvest flow differences in applying a constant 7% volume adjustment with use of the Fraser Protocol. Initial harvest levels could be increased by 8% to 3 250 000 cubic metres using the protocol relative to the 3 0000 00 cubic metres in the base case using a constant 7% adjustment. This suggests that any uncertainty associated with not using the protocol should not pose a risk to attainment of the short-term harvest levels in the base case.

In reviewing this factor with BCFS staff, I am satisfied that the timber supply analysis reasonably accounted for this factor by increasing volume estimates in the forest inventory by 7% based on the best available information from VRI phase 2 ground sampling.

I recognise under "Implementation" the need in the Okanagan TSA for VRI phase 1 re-inventory work to be completed given the age of the existing forest inventory.

- volume estimates for existing unmanaged stands

In the timber supply analysis, estimates of timber volumes in existing unmanaged stands were projected using the Variable Density Yield Prediction (VDYP) model version 6.6d. Unmanaged stands are assumed to be those that are at least 21 years of age. Yields for selection harvest dry-belt Douglas-fir stands were projected using VDYP.

Analysis units for unmanaged stands are based on combinations of stands (forest cover polygons) based on similar attributes such as inventory type group, age class, biogeoclimatic unit, forest cover inventory site index and wet-belt/dry-belt (to facilitate application of new site productivity information).

In the timber supply analysis, yield tables for unmanaged stands were prepared based on weighted average attributes from each forest cover polygon. Decay, waste and breakage factors for the appropriate area (e.g. forest inventory zone) were used. Volumes were increased 7% to account for VRI phase 2 sampling as previously discussed.

A sensitivity analysis that assessed the effects of increasing or decreasing unmanaged stand yield volumes by 10% showed a corresponding 10% increase or decrease in short-term harvest levels with no long-term impact.

Unmanaged (natural) stand yield tables were modelled in the timber supply analysis using standard procedures and I accept their use as appropriate in support of this determination.

Expected rate of growth

- site productivity estimates

Inventory data include estimates of site productivity for each forest stand, expressed in terms of a site index. The site index is based on the stand's height as a function of its age. The productivity of a site largely determines how quickly trees grow. This in turn

affects the time seedlings will take to reach green-up conditions, the volume of timber that can be produced, and the ages at which a stand will satisfy mature forest cover requirements and reach a merchantable size.

The most accurate estimates of site productivity come from stands between 30 and 150 years of age. The growth history of stands less than 30 years of age is often not long enough to give accurate measurements of site productivity. Estimates derived from older stands underestimates site productivity as these stands are often well past the age of maximum height growth and have often been affected by disease, insects and top damage as they reach advanced age. The underestimate of site productivity based on forest inventory estimates for older stands have been verified in several studies (e.g. Old–Growth Site Index or OGSI study) in the province. These studies have confirmed that when old stands are harvested and regenerated, site productivity realized is generally higher than inventory-based site index estimates of older stands would predict.

In order to derive a better estimate of site productivity for regenerated stands, the OIFS conducted studies in the "wet belt" and "dry belt" portions of the Okanagan TSA.

To determine the site index of regenerating stands in the wet belt, a biophysical model/site index adjustment (SIA) project was completed in 2002. The biophysical model predicts preliminary estimates of site index across the entire wet-belt as a function of biogeoclimatic subzone, elevation, slope position, aspect and bedrock geology. To adjust the preliminary site index estimates, 65 random ground samples were established to measure site index in managed stands primarily occurring in lower elevations. These plots were used to adjust the preliminary site index estimates from the model in the Interior Cedar-Hemlock (ICH) and Interior Douglas-fir (IDF) zones for lodgepole pine and Douglas-fir leading polygons. For higher elevations in the Englemann Spruce–Subalpine Fir (ESSF) zone, few managed stands were old enough to sample and the biophysical model alone was used to derive estimates of lodgepole pine, Douglas-fir and spruce leading polygons.

The overall adjustments had a weighted site index average of 21.5 metres compared to 18.0 metres based on the forest cover inventory. These differences are consistent with findings in similar projects in other management units. The lower elevation areas with site index adjustments based on ground samples represents about 70% of the productive forest land base in the wet belt. This suggests that any uncertainty resulting from adjustments made at higher elevations (that were not adjusted based on ground samples) are likely not to pose a significant risk to short-term timber supply.

For the dry belt, Predictive Ecosystem Mapping (PEM) was used in conjunction with Site Index Biogeoclimatic Ecosystem Classification (SIBEC) ground plots to assign site index for regenerating stands. The SIBEC data comprised a combination of locally sampled plots and existing MOF SIBEC data for a total of 939 sample plots. The dry belt PEM mapping used standard methods and was approved by BCFS staff for use in timber supply analysis.

Depending on data reliability, the timber supply analysis used SIBEC-based site indices for 53% of the timber harvesting land base in the dry belt, site index species conversion equations for 16% of the land base, and used existing and unadjusted forest cover site

index estimates for the remaining 31% of the land base. The overall effect of these approaches resulted in a weighted site index average of 16.5 metres compared to 14.6 metres based solely on forest cover inventory.

These improved estimates of site productivity for both the wet belt and dry belt were used in the timber supply analysis to reflect the productivity of regenerating stands and enabled the base case harvest forecast to achieve a long-term level of 2 930 000 cubic metres per year.

A sensitivity analysis was undertaken that increased and decreased site productivity estimates by 1.0 metres. A 1-metre increase in site productivity allowed increased mid-term and long-term harvest flows relative to the base case; long-term harvests increased by about 12% to 3 270 000 cubic metres. A 1-metre decrease in site productivity decreased mid- and long-term harvest levels with volumes decreasing by about 14% to 2 530 000 cubic metres in the long term. The sensitivity analysis, however, showed that neither an increase or decrease of site productivity by 1 metre would affect short-term harvest levels projected in the base case.

BCFS staff accept the site productivity information collected and modelled in the timber supply analysis as reasonable. Although there is concern with lack of ground-based samples at high elevations in the wet belt, there is also realization that there are relatively few sample opportunities in the ESSF due to limited history of forest harvesting.

In reviewing this factor, I find the adjustments made to site productivity are consistent with similar studies done elsewhere in BC and accept their use in the timber supply analysis for the Okanagan TSA.

- volume estimates for regenerated managed stands

In the analysis, the standard BCFS growth and yield model Table Interpolation Program for Stand Yields or TIPSY (version 3.0a) was used to estimate the timber volumes for regenerated managed stands. The model was applied to all future regenerated stands and to all existing stands 20 years old or less. Major inputs to the TIPSY model include species composition, regeneration delay, site index, operational adjustment factors and genetic worth of planting stock. The site productivity estimates previously discussed were used to provide site index.

The TIPSY projections are initially based on ideal conditions, assuming full site occupancy and the absence of pests, diseases and significant brush competition. However, certain operational conditions, such as a less-than-ideal distribution of trees, the presence of small non-productive areas, endemic pests and diseases, or age-dependent factors such as decay, waste and breakage, may cause yields to be reduced over time. Two operational adjustment factors (OAFs) are therefore applied to yields generated using TIPSY, to account for losses of timber volume resulting from these operational conditions. OAF 1 is designed to account for factors affecting the yield curve across all ages, such as small stand openings. OAF 2 accounts for factors whose impacts tend to increase over time such as pests, disease, decay, waste and breakage.

In the Okanagan TSA timber supply analysis, the standard provincial reductions of 15 percent for OAF1 and 5 percent for OAF2 were applied to all lodgepole pine stands

and some dry-belt Douglas-fir and balsam stands. Balsam and spruce stands growing on good and medium sites received reductions of 20% for OAF1 and 0% for OAF2.

For regenerating cedar- and hemlock-leading stands and wet-belt Douglas-fir stands in which root disease is endemic, OAFs were derived using estimates of expected volumes based on BCFS regional staff expert review. This led to substantially higher OAF reductions for some of these species groups than applied in most areas of the province.

OIFS sampled 50 pine-leading stands, following BCFS guidelines, to assess OAFs. The findings were that the revised OAF1 estimates for pine stands in the TSA should be 12.9% in the wet-belt and 10.8% in the dry-belt. These findings were not used in the base case. Applying these results in a sensitivity analysis demonstrated an increase in long-term harvest flow of 60 000 cubic metres (about a 2% increase).

A sensitivity analysis that assessed the effects of increasing or decreasing managed stand yields by 10% showed approximately proportional changes in long-term harvest levels relative to the base case.

For the purposes of this determination, I accept how volume estimates for regenerated managed stands were addressed in the base case. Given the recent OAF sampling study, I recognize that there may be a potential upward pressure on timber supply in the long-run for lodgepole pine stands. Other species need to be assessed as well given concerns such as root rot. Any improved overall knowledge related to this factor can be addressed in subsequent determinations.

- genetic worth

Use of select seed with improved genetic traits can increase timber volumes of managed stands in the long term and quicken the time for a stand to reach a green-up height or reach minimum harvestable age. The quantity and quality (genetic worth) of select seed has increased in the past decade, and is projected to increase further, throughout the province including the Okanagan TSA. Licensees are required to use select seed when available and currently do so for all spruce, about 20% of lodgepole pine, and about 50% of larch plantings.

In the timber supply analysis, the volume gains expected at harvest age from the use of select seed were accounted for in future managed stand yield tables. Genetic gains were assumed for all spruce plantings as this is current practice which resulted in overall volume gain of 4% for spruce. Genetic gains for lodgepole pine were applied in the model to select analysis units with intent that this would emulate overall gains throughout the TSA. There was some concern expressed by BCFS staff that this approach could cause an unknown bias.

BCFS staff also noted that licensees appear to be relying more on natural regeneration than assumed in the timber supply analysis; consequently, the level of planting needed to achieve the genetic gains assumed in the timber supply analysis might not occur in the future.

For this determination, I conclude that the base case reasonably reflects the use of select seed in the TSA. Any uncertainty in this factor mainly impacts long-term timber supply, and does pose a risk to short-term timber supply. Nevertheless, there is a need to monitor performance to assess if the projected gains are reasonable to assume based on actual practices. Under "Implementation", I request that the Reporting Silviculture Updates and Landstatus Tracking System (RESULTS) be reviewed to assess regeneration methods and actual use of select seed prior to the next determination.

- *minimum harvestable ages*

A minimum harvestable age is an estimate of the earliest age at which a forest stand has grown to a harvestable condition. The minimum harvestable age assumption mainly affects when second growth stands will be available for harvest within the timber supply model. This, in turn, affects how quickly existing stands may be harvested such that a stable flow of timber harvest may be maintained. In practice, many forest stands will be harvested at much older ages than the minimum harvestable age, due to economic considerations or forest cover constraints on harvesting that arise from managing for such values as visual quality, wildlife and water quality.

The timber supply analysis assumed that minimum harvestable age was 80 years for lodgepole pine and 100 years for all other species. Since the TSA's timber supply appears to be relatively robust, some uncertainty in these assumptions is not expected to have a significant effect on projected harvest flows.

After discussing this factor with BCFS staff, I accept the approach taken in the analysis as appropriate for use in this determination.

(ii) the expected time that it will take the forest to become re-established on the area following denudation:

Regeneration delay

Regeneration delay is the period between harvesting and the time at which an area becomes occupied by a specified minimum number of acceptable, well-spaced seedlings. In the timber supply analysis, an average regeneration delay of 2 years was assumed.

BCFS district staff expressed concern that some plantations fail due to factors such as fire and drought and that these failures, although not frequent, are not accounted for in the analysis. Concern was also expressed that apparent increased reliance on natural regeneration may mean the assumed average 2-year regeneration delay will not be achieved.

Although I accept that this factor has been reasonably accounted for in support of this determination, under "Implementation" I request that RESULTS data be reviewed for the TSA to assess actual regeneration delay before the next timber supply review. This will reduce the current uncertainty in this factor when the next timber supply review is undertaken.

Not-satisfactorily-restocked areas

Not-satisfactorily-restocked (NSR) areas are those where timber has been removed, either by harvesting or by natural causes, and a stand of suitable forest species and stocking has yet to be established. Areas where the standard regeneration delay has not yet elapsed since harvesting are considered 'current' NSR and fluctuate with the amount of disturbance (e.g. harvesting, fires) currently taking place. Since 1987 there is a legal obligation to reforest harvested areas. Where a site was harvested prior to 1987 and a suitable stand has not yet been regenerated, a classification of 'backlog' NSR is applied.

In the timber supply analysis, areas labelled NSR in the forest inventory were assigned age 0 in the analysis; that is, they were assumed to just now be satisfactorily restocked. BCFS district staff indicated these areas were likely current NSR due to recent harvesting and not older backlog NSR. Given the age of the inventory, BCFS staff believe many of these areas are in fact older than the 0 years of age assumed in the analysis. As a consequence, the long-term timber supply forecast in the base case may be underestimated.

Although NSR assumptions may slightly underestimate timber supply in the long term, this is not expected to exert an upward pressure on short term timber supply of any consequence in the context of this determination. Reducing uncertainty in this factor should be considered in support of subsequent determinations; in the meantime, I find the assumptions made in the analysis provide a suitable basis for this determination.

(iii) silvicultural treatments to be applied to the area:

Silvicultural systems

Approximately 94% of the Okanagan TSA harvest is clearcut or clearcut with reserves based on review of forest development plans with the remaining 6% harvest using a selection system. These current practices were reflected in the timber supply analysis.

Assumptions made related to initial amount of volume harvested using selection systems in Douglas-fir stands as well as the timing and harvest volume in these stands in the future. There is recognition, however, that there is insufficient information to know how accurate these assumptions really are.

I accept that the timber supply analysis has appropriately accounted for this factor for the purposes of this determination. I also acknowledge that there is uncertainty related to the modelling of selection Douglas-fir stands given lack of information, and that this is part of a larger on-going provincial issue regarding the timber supply implications associated with selection or partial cut harvest systems.

Incremental silviculture

In general, incremental silviculture includes activities such as commercial thinning, juvenile spacing, pruning and fertilization that are not part of the basic silviculture obligations required to establish a free-growing forest stand.

Between 1995 and 1999 about 8155 hectares were spaced, 234 hectares were fertilized and 3407 hectares were pruned. A commercial thinning pilot study in small diameter lodgepole pine was initiated in 2001/2002. These activities, although important locally, are not likely to have a measurable effect on timber supply within the TSA given the limited area treated.

No incremental silvicultural activity is assumed in the timber supply analysis. BCFS district staff believe this reasonably reflects current practice since incremental silvicultural activity is very minor in the Okanagan TSA.

The level of incremental silviculture undertaken in a given management unit is very dependent on funding and is difficult to project into the future. If the amount of incremental silviculture actually practised differs significantly from that assumed in the analysis, this can be reflected in future AAC determinations. For the purposes of this determination, I am satisfied with the treatment of this factor in the analysis.

(iv) the standard of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area:

Utilization standards

Utilization standards define the species, dimensions and quality of trees that are harvested and removed from an area during harvesting operations. In the timber supply analysis, a 30-centimetre maximum stump height and 10-centimetre minimum top diameter was assumed for all species. In addition, for lodgepole pine, a 12.5 centimetre minimum diameter at breast height (DBH), and for all other species, a 17.5 centimetre DBH, was modelled. These assumptions are standard utilization levels used in most timber supply reviews in comparable TSAs and TFLs in the interior.

Although utilization policies and waste benchmarks are changing, BCFS staff do not believe this will substantially affect AAC volumes given current waste assessment procedures. Any unused volumes that fall above future waste benchmarks are likely to be charged to the AAC under current "take or pay" utilization policy.

I accept the assumptions employed in the base case regarding utlization as reasonable. I will not speculate if utilization practices may or may not change in the future in response to revised government policies and procedures. If practices do in fact change as it relates to AAC volumes, this can be addressed in subsequent determinations.

Decay, waste and breakage

The VDYP model used in the timber supply analysis to project volumes for existing unmanaged stands incorporated estimates of volumes of wood lost to decay, waste and breakage. These estimates of losses have been developed for different areas of the province based on field samples. As previously discussed, operational adjustment factors (OAFs) were used in the timber supply analysis to account for decay, waste and breakage in volume estimates for regenerated managed stands.

I am satisfied that appropriate procedures were followed to account for decay, waste and breakage in the base case and represent use of best available information.

(v) the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production:

Integrated resource management objectives

The Ministry of Forests and Range is required under the *Ministry of Forests Act* to manage, protect and conserve the forest and range resources of the Crown and to plan the use of these resources so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated. The Forest Practices Code, the *Forest and Range Practices Act* and other legislation provide for, or enable, the legal protection and conservation of timber and non-timber values. Accordingly, the extent to which integrated resource management (IRM) objectives for various forest resources and values affect timber supply must be considered in AAC determinations.

The timber supply analysis has addressed some IRM objectives through reductions in the timber harvesting land base. I have accounted for these factors in 'Land base contributing to timber harvesting.' In this section, I account for IRM objectives where the land base continues to contribute to timber supply but are subject to various forest cover and adjacency constraints.

- cutblock adjacency, forest cover and green-up

To manage for resources such as water, wildlife and scenic areas, and to avoid concentrating harvesting-related disturbance in particular areas, operational practices limit the size and shape of cutblocks and maximum disturbances (areas covered by stands of less than a specified height), and prescribe minimum green-up heights required for regeneration on harvested areas before adjacent areas may be harvested. Green-up requirements help to achieve objectives for water quality, wildlife habitat, soil stability and aesthetics. Adjacency, green-up and forest cover objectives guide harvesting practices to provide for a distribution of harvested areas and retained forest cover in a variety of age classes across the landscape.

In the timber supply analysis for the Okanagan TSA, in order to represent the desired conditions necessary to meet the various objectives in different areas consistent with the OS-LRMP, the timber harvesting land base was zoned for different values such as visual resources, community watersheds and ungulate winter range where varying forest cover requirements apply. These are discussed later for each of these values.

For the general IRM zone, the OS-LRMP identifies the need for a 2 metre green-up and this was modelled in the timber supply analysis. The analysis also assumed a maximum disturbance of 30% which was spatially modelled for the first 30 years. The modelling of cutblock adjacency using the spatial capabilities of Timberline's CASH6 generally is more constraining on timber supply than using aspatial models like the BCFS's FSSIM. Which modelling technique is more operationally realistic, however, is not known at this time.

In reviewing this information, I am satisfied that the timber supply analysis appropriately accounted for green-up and cutblock adjacency in the IRM zone for use in this determination.

- scenic areas

The Code and FRPA enable scenic areas to be designated and visual quality objectives (VQOs) to be established so that the visible evidence of forest harvesting can be kept within acceptable limits.

The OS-LRMP classified the TSA into 3 visual landscape management zones. Zone 1 called for the legal establishment of scenic areas and VQOs and this was done in 2001 by the three BCFS district managers who at that time had responsibilities for the TSA. The VQOs were modelled in the timber supply analysis. Zones 2 and 3 did not call for establishment of scenic areas and are not believed to measurably impact timber supply at the TSA level; these zones therefore were not modelled in the analysis.

Specific assumptions regarding maximum allowable visible alteration and visually effective green-up (VEG) height were made for different portions of Zone 1 based on VQO and visual absorption capability. The maximum removal percentages were assumed consistent with the minister's memo (Appendix 4) and standard procedures (i.e. *Procedures for Factoring Visual Resources into Timber Supply Analyses*).

In reviewing this information with BCFS staff, I am satisfied that the timber supply analysis appropriately accounted for scenic areas and VQOs in the base case.

- identified wildlife

The province's Identified Wildlife Management Strategy (IWMS) addresses plant communities and species at risk, and regionally significant species. "Identified wildlife" are those wildlife species and plant communities that have been established as requiring special management.

Identified wildlife can be protected through the establishment of wildlife habitat areas (WHAs) with objectives or general wildlife measures. The objectives or general wildlife measures may preclude or constrain timber harvesting activity depending on the requirements of individual identified wildlife species or communities.

Government policy direction limits the timber supply impact of the IWMS to one percent. Operational policy direction has been to initially allocate the one percent impact equally to each forest district with acknowledgement that this approach can be refined if warranted. Impacts greater than one percent can still be addressed by government if required to protect species at risk, but using other tools such as land use decisions.

The Okanagan TSA is biologically diverse and contains a number of ecosystems and associated species that are unique or with very limited distribution; 66 species were identified as either at risk or regionally significant within the TSA. Currently established WHAs in the TSA are considerably less than the one percent allocation.

Draft objectives by the Ministry of Environment (MOE) for identified wildlife suggest a 0.8% impact on mature timber volumes within the timber harvesting land base. OS-LRMP direction allows for the protection of other rare species not currently covered by the IWMS which could reduce the land base by a further 300 to 400 hectares.

The timber supply analysis accounted for the IWMS by reducing all existing stand yields by 1% to reflect government policy on expected timber supply impacts. This is a standard approach used in many timber supply reviews throughout the province.

There have been a significant number of WHAs established in the Okanagan TSA as compared to other TSAs. However, there has been a relatively small timber supply impact due to the location of many of these WHAs. Therefore I consider the approach taken in the timber supply analysis to be appropriate for the purpose of accounting for identified wildlife in this determination. The 1% impact appears to be consistent with draft MOE objectives and OS-LRMP direction. If future decisions are made by government regarding the management of identified wildlife and species at risk that result in impacts on timber supply that are different than those assumed in the base case, this can be accounted for in subsequent determinations.

- deer winter range

Notice providing winter range objectives for mule deer has been issued under section 7(2) of the *Forest Planning and Practices Regulation*. The notice is based on the OS-LRMP recommendations and identifies a total area of 213 192 hectares of winter range including 128 279 hectares in the timber harvesting land base. Forest cover objectives vary depending on snow pack zones which are defined using biogeoclimatic units.

The timber supply analysis used broad assumptions when modelling winter range. Landscape units (or planning cells) were not used and generalizations were therefore made about distribution of timber harvesting land base. For example, for the moderate snow pack zone, the analysis assumed at least 16.5% of stands in the timber harvesting land base are required be over 175 years of age while 16.5% of other stands need to be over 120 years of age in order to achieve an overall 33% cover objective. This assumes about a 50:50 split between lands in versus lands out of the timber harvesting land base within the winter range.

In reality over 60% of the deer winter range is in the timber harvesting land base and only 4% of the landscape unit/biogeoclimatic unit polygons have more than 50% outside of the timber harvesting land base.

A sensitivity analysis was undertaken where 28% of the timber harvesting land base within the winter range needed to be above 175 years of age in the moderate snowpack zone. This resulted in a 2% decrease in mid-term and 1% decrease in long-term harvest flows.

Comments from MOE and BCFS staff concur that the timber supply analysis likely underestimated impacts of deer winter range management on timber supply. The sensitivity analysis appears to be a closer approximation to what the impacts are likely to

be. I therefore recognize in my "Reasons for Decision" a 2% mid-term and 1% long-term downward pressure on timber supply based on this factor.

- caribou habitat

Mountain caribou in the Okanagan TSA have been designated as an identified wildlife. The OS-LRMP identified 110 301 hectares of caribou winter habitat including 62 924 hectares in the timber harvesting land base, and a further 17 845 hectares as corridors for caribou movement. For the winter habitat, the OS-LRMP recommended 9900 hectares of the timber harvesting land base be reserved as old growth management areas (OGMAs) and that harvesting be limited to a maximum of 825 hectares per year of age class 8 and 9 stands. At least 30% of the corridor areas are to have stands with trees greater than 16 metres in height.

A large project is underway which is investigating caribou populations, habitat use and interaction with forest management and is due for completion in 2006. The OS-LRMP recognized that further research may result in improved recommendations for caribou management.

A notice under section 7(2) of the *Forest Planning and Practices Regulation* that provides objectives for identified wildlife indicates that a minimum of 2086 hectares of the timber harvesting land based could be allocated towards meeting caribou habitat requirements. This is additional to OS-LRMP direction that 9900 hectares be reserved as OGMAs.

The timber supply analysis addressed caribou habitat in its accounting for *identified wildlife*, which I have previously addressed, and OGMAs which I address later under *landscape level biodiversity and old forest retention*. It was assumed in the analysis that that there would be no additional timber supply implications needed to account for caribou management.

In reviewing the approach taken in the timber supply analysis to account for caribou, and in discussions with BCFS staff, I am satisfied that the timber supply analysis has adequately accounted for caribou habitat in the base case. If government provides new direction for the management of caribou, this can be addressed in subsequent timber supply reviews.

- grizzly bear habitat

Grizzly bears in the TSA have also been designated as identified wildlife. The OS-LRMP identified grizzly bear habitat where objectives include retaining forest cover on one side of avalanche chutes, reduced stocking standards for selected ecosystems, and the maintenance of at least 10% of 1000-hectare units in stands greater than 19.5 metres in height. Forest operational plans have been following this OS-LRMP direction.

The timber supply analysis identified a 138 775 hectare grizzly bear management zone with 35 229 hectares in the timber harvesting land base. Since 1000-hectare units have not been delineated in the TSA, the analysis required 10% of each landscape unit/biogeoclimatic subzone polygon have stands greater than 19.5 metres in height.

Forest cover objectives may be more limiting when applied to 1000-hectare units; if these units are established, they can be modelled in subsequent determinations. In the meantime, I accept the analysis has reasonably accounted for grizzly bear management for use in support of this determination.

- habitat for other wildlife

The OS-LRMP provides specific objectives in specified areas for habitat management of marten, bighorn sheep, elk, moose and mountain goat. These objectives were modelled in the timber supply analysis. For example, in the marten habitat zone, at least one-third of all stands need to be greater than 19 metres in height; in the moose, elk and bighorn sheep habitat zones, at least one-third of all stands need to be greater than 16 metres in height; and in the goat habitat zone, at least 10% of the stands need to be at least 150 years of age.

I accept that the timber supply analysis has reasonably accounted for the management of these species as the analysis reflects the direction provided in the OS-LRMP.

- community watersheds

There are currently 50 designated community watersheds within the Okanagan TSA. Interior watershed assessment plans (IWAPs) have been completed for many of the watersheds. The timber supply analysis applied a constraint that not more than 30% of each community watershed could be less than 6 metres in height (which was modelled as 28 years). This constraint reflects an average of the expected practices in the watersheds. A sensitivity analysis assessed use of a 25% maximum disturbance constraint and found no impact on timber supply.

BCFS staff believe the timber supply analysis appropriately modelled community watersheds for the purposes of this determination, but also note that there is some uncertainty about the use of average management objectives across all community watersheds versus the application of specific objectives for each watersheds based on the IWAP for individual community watersheds.

I concur with this conclusion and accept that the analysis has reasonably accounted for this factor in the context of a TSA-wide timber supply review.

- lakeshore management

Lakeshore management zones and objectives have been established under the *Forest Practices Code* and this has been grandparented to apply under the *Forest and Range Practices Act*. The lakeshore management zone includes a 210-metre wide zone around classified lakes.

In order to address the objectives for lakeshore management zones, the timber supply analysis identified forest cover requirements for each zone based on lake classification, visual quality objective and visual absorption capability. This led to a maximum allowable visible alteration and visually effective green-up (VEG) height being specified for each zone.

In reviewing this factor with BCFS staff, I am confident that lakeshore management has been appropriately modelled in the base case.

- landscape-level biodiversity and old forest retention

Landscape-level biodiversity can be conserved by maintaining forests with a variety of patch sizes, seral stages, and forest stand attributes and structures, across a variety of ecosystems and landscapes. Given other forest management provisions that provide for a diversity of forest stand conditions, old forest retention is often considered a key landscape-level consideration. Old forest retention can be achieved through the location of old growth management areas (OGMAs).

Old forest retention objectives have been legally established for the Okanagan TSA as part of a provincial non-spatial old growth order. The objectives provide retention levels consistent with the OS-LRMP recommendations. The timber supply analysis used these objectives when modelling the base case.

Since the timber supply analysis was undertaken in 2002, approved draft OGMAs were established in 2004 (as enabled for by the provincial old growth order) which then replaces the non-spatial retention levels. Ministry of Agriculture and Lands (MOAL) staff expressed concerns that modelling the OGMAs may have a greater impact on timber supply than what was assumed in the base case.

Important old forest retention issues that have yet to be resolved in the OS-LRMP area, including the TSA, relate to the draw-down of retention objectives for low biodiversity emphasis option areas and whether OGMAs can be replaced. For example, should the 3000 hectares of OGMAs identified in the Okanagan Mountain Park that have subsequently been affected by wildfire be replaced?

It is important to resolve these issues and to use the spatially located OGMAs where legally established in support of the next timber supply review to allow for a current accounting of old forest retention in the TSA. For now, I am satisfied that the timber supply analysis has reasonably accounted for old forest retention as it modelled legal requirements in place at the time of the analysis. There may be a downward pressure associated with the recent spatial location of draft OGMAs but this can be better addressed in the next determination. I do not believe uncertainty in this factor will pose a consequential risk to short-term timber supply particularly in light of other key factors that affect this determination such as the mountain pine beetle epidemic.

- stand-level biodiversity and wildlife tree retention

Wildlife tree patches are an important part of stand-level biodiversity. The Code and FRPA both provide for the retention of wildlife trees in harvested areas. The OS-LRMP recommended that the wildlife tree retention levels provided in the Landscape Unit Planning Guide apply to the Okanagan TSA. Planning staff with the now Ministry of Agriculture and Lands commented that they intend to legally establish the wildlife tree retention levels as land use objectives.

In the timber supply analysis, an overall volume reduction of 3% was applied to forest stands to account for wildlife tree retention consistent with the Guide. A similar approach was taken in the previous BCFS 2000 timber supply analysis that supported the previous determination. BCFS staff believe that the model has appropriately accounted for this factor, and I support that conclusion.

(vi) any other information that, in the chief forester's opinion, relates to the capability of the area to produce timber;

Other information

- harvest sequencing

In timber supply analysis, the order in which eligible stands are assumed to be harvested can affect the projected timber supply in a number of ways. Any difference between the modelling assumptions made and the order in which stands are actually harvested in operational practice must be examined and accounted for.

In the base case the oldest available forest stands are harvested first. No priority was assigned pine stands that are affected by the mountain pine beetle epidemic. This causes some uncertainty in that the model is harvesting stands that likely will not reflect the harvest profile based on current or expected practice given the beetle epidemic.

This issue is addressed under *mountain pine beetle epidemic* where scenarios are explored that do target pine stands.

- actual harvest level

From 2000 to 2004, actual harvest levels represent on average about 110% of the AAC. The over-cut is largely attributable to BC Timber Sales' efforts to address priority pine stands to help control the spread of mountain pine beetles in the TSA. Forest licensees have been able to respond to previous uplifts in 1987 to 1993 in response to beetle infested stands. Based on this information, I believe there is capacity to harvest the AAC, including any uplifts required to address the current mountain pine beetle epidemic, based on past or current operational practices. I have taken this consideration into account in my determination.

- Innovative Forest Practices Agreements

Licensees with replaceable forest licences in the Okanagan TSA have Innovative Forestry Practices Agreements (IFPAs). Working together as the Okanagan Innovative Forestry Society (OIFS), the licensees have undertaken a number of projects which are reflected in the timber supply analysis.

The regional executive director's decision under Section 59.1 of the *Forest Act* regarding an increase in the AAC authorized in an IFPA-holder's licence based on innovative forestry practices, differs from my Section 8 AAC decision. While the regional executive director's decision should consider the factors that I consider under Section 8(8), the

regional executive director can limit an increase to a period of time, land type, timber type or subject it to specific conditions. The flexibility for conditions under Section 59.1 may enable the regional executive director to balance short-term risks with appropriate conditions. As such, independent decision-makers using similar information and analysis but working under different decision processes may have different views of risk and uncertainty. I also note that if the regional executive director were to reduce an AAC increase awarded to an IFPA holder, I would likely consider if changes in information available to the regional executive director have implications for my decision. Some of the interests raised by First Nations that I am unable to address have been forwarded to the regional executive director for consideration (see *First Nations consideration* below).

- Okanagan Shuswap Land and Resource Management Plan

Strategic plans such as the Okanagan Shuswap Land and Resource Management Plan (OS-LRMP) provide context and direction for forest operational planning by providing objectives for the management of various forest resources. The OS-LRMP was approved by Cabinet in 2001. Implementation of the plan is enabled through various legal tools and through the recommendations and guidance it provides.

I am aware that current practices in the Okanagan TSA are guided by the recommendations arising from the OS-LRMP, and that these recommendations were used in the development of the timber supply analysis. I have discussed this in the various factors described in this document. If, during further implementation of the OS-LRMP, management considerations for specific values become less or more constraining on timber supply, then this can be factored into subsequent timber supply reviews in support of future determinations.

- deciduous volumes

In the last timber supply review, deciduous volumes were not included in the analysis that led to an AAC decision. As a consequence, any deciduous volumes harvested that were incidental to coniferous harvesting operations were treated as "off quota" (i.e. they were not charged to the AAC). This spawned a local deciduous-based industry with 9 independent sawmills that produced cabinets, furniture stock and flooring from birch provided by major licensees and woodlot operators.

In 2004, an interpretation of the *Forest Act* (section 75.1) resulted in all deciduous volumes being charged to the AAC. In addition, a new policy required deciduous volumes to be in included in appraisal. As a consequence of these changes, licensees are less willing to harvest the deciduous volumes in coniferous-leading stands.

In the 2002 timber supply analysis, deciduous volumes in coniferous-leading stands do not contribute to the base case. Short-term deciduous volumes that were not in the base case were assessed to average about 38 000 cubic metres per year which is more than double the 15 000 cubic metre average harvested between 2001 and 2003.

The BCFS district office believes a deciduous partition would help facilitate a return of volumes to the deciduous-based industry that has developed in the TSA. I concur that a deciduous partition would help ensure volumes are provided and I address this as an upward pressure in my "Reasons for Decision". A partition of 20 000 cubic metres addresses the apparent need of a local deciduous-based industry while still being well within the opportunity indicated in the analysis. These volumes should only be harvested from coniferous-leading stands where not required to fulfil other management objectives. The need to continue with this partition can be revisited in the next determination.

- First Nations considerations

First Nations that reside in and/or have asserted traditional territories within the Okanagan TSA were consulted about both this timber supply review, and any subsequent allocation decisions related to the apportionment of the AAC made by the minister. The following First Nations and bands were contacted: the Okanagan Nation Alliance (Sylix Nation) and seven affiliated bands (Lower Similkameen, Upper Similkameen, Osoyoos, Penticton, Westbank, Okanagan and Upper Nicola); and the Shuswap Nation Tribal Council (Secwepemc Nation) and four affiliated bands (Adams Lake, Neskonlith, Little Shuswap and Spallumcheen).

Consultation initially included an information sharing process that explained the AAC process to each First Nation; this was initiated on May 25, 2005 prior to the distribution of the public discussion paper on July 7, 2005. The discussion paper provided for a 60-day public review and comment period, however, it was noted to First Nations that comments provided prior to the determination will be considered. BCFS staff responded to information requests, answered questions and provided written responses to written submissions from First Nations.

The consultation process consisted of:

- a letter to initiate the process on May 25, 2005;
- an initial meeting on June 22, 2005 to discuss the process and identify general concerns;
- a follow-up letter in July 2005 to update First Nations on the consultation process and provide the public discussion paper;
- a further follow-up letter to update First Nations on the consultation process and an invitation to attend a consultation session was sent, in order to present and discuss information regarding the timber supply review and AAC determination process, as well as request information regarding aboriginal interests and how those interests may be impacted; these sessions included:
    - a consultation session held for the Shuswap Nation Tribal Council and affiliated bands on September 13, 2005
    - a consultation session held for the Okanagan Nation Alliance and affiliated bands on September 14, 2005; and,
    - consultation sessions held with the Lower Similkameen and Upper Similkameen Indian Bands in October 2005.

First Nations raised a number of issues during the consultation process. Concern was raised that sacred areas were not being adequately accounted for in the timber supply analysis; I addressed this issue under *archaeological and cultural heritage resources* where I recognized a downward pressure on timber supply due to sacred areas. Other key issues raised by First Nations that can impact timber supply included:

- disagreement with the direction and recommendations in the LRMP;
- need for increased retention around riparian and wetlands in large salvage operations associated with the mountain pine beetle epidemic;
- need for increased retention of non-pine species given the pine beetle epidemic;
- need for a higher netdowns to address species at risk particularly given that the Okanagan TSA has the highest number of species at risk in the province.

With respect to these concerns:

- although I appreciate concerns about the LRMP, the existing Cabinet approved OS-LRMP which has in part been legally implemented using various legislative tools provides the direction and recommendations related to forest management which are being reflected in current practices, and in keeping with my guiding principles, I need to account for this in my determination. Should this direction change in response to aboriginal interests or any revisions in the OS-LRMP, this can be addressed in subsequent timber supply reviews which must be take place within 5 years of this determination;
- the Okanagan Shuswap Forest District *Mountain Pine Beetle Management Strategy* includes the need for increased retention within cutblocks through retention planning that should help address this concern as part of operational practice, and increased retention for landscape- and stand-level biodiversity was accounted for in each of the scenarios discussed later under *mountain pine beetle epidemic;*
- as discussed increased retention of non-pine was modeled in the uplift scenarios discussed later under the *mountain pine beetle epidemic* and is consistent with the District's *Strategy;*
- related to species at risk, as discussed under *identified wildlife*, the 1% provincial netdown applied in the timber supply analysis appears to accommodate MOE objectives for identified wildlife and OS-LRMP direction. If future decisions are made by government regarding the management of identified wildlife and species at risk that result in impacts on timber supply that are different than those assumed in the base case, this can be accounted for in subsequent determinations.

First Nations raised a number of concerns related to the allocation of timber as a consequence of any decision to increase the AAC. First Nations generally want to be allocated harvest rights. The issues raised by First Nations in this regard, as a result of the consultation process, have been or will be directed to the minister (who has authority to make apportionment decisions) for consideration.

Forest and range agreements (FRAs) are interim agreements between MOF and eligible First Nations designed to provide for workable accommodation of aboriginal interests

that may be impacted by forestry decisions during the term of the agreement until such time as those interests are resolved through treaty. FRAs provide First Nations a direct award forest tenure and a share of forestry revenues. All of the bands in the Okanagan TSA have been offered FRAs and five First Nations have signed agreements.

In reviewing First Nations input, I believe my determination has reflected on the interests and concerns expressed that relate to my area of authority. Many other issues were also raised by First Nations during the consultation process that were not directly related to the timber supply review or to any subsequent allocation decision. While I am unable to address those concerns that are beyond the ambit of my jurisdiction, I will endeavor to forward those concerns and interests for consideration to other appropriate decision-makers.

(b) the short and long term implications to British Columbia of alternative rates of timber harvesting from the area;

Alternative harvest flows

The nature of the transition from harvesting old growth to harvesting second growth is a major consideration in determining AACs in many parts of the province. In keeping with the objectives of good forest stewardship, AACs in British Columbia have been and continue to be determined to ensure that short-term harvest levels are compatible with a smooth transition to medium and long-term levels. Timber supplies need to remain sufficiently stable so that there are no inordinately adverse impacts on current or future generations. To achieve this, the AAC determined must not be so high as to cause later disruptive shortfalls in supply nor so low as to cause immediate social and economic impacts that are not required to maintain forest productivity and future harvest stability.

The base case harvest forecast for the Okanagan TSA was developed to provide an initial harvest level that still allows a smooth transition from short-term levels to medium and long-term levels. Two alternative harvest flows were provided.

One alternative showed the harvest flow that could be maintained without any subsequent decreases or increases; this "flatline" harvest flow was 2 700 000 cubic metres per year which is 10% lower than the short-term harvest levels in the base case.

Another alternative explored the maximum first decade harvest level followed by a 10% decrease to mid-term levels. In this alternative, the initial harvest level is 3 800 000 cubic metres (about 27% higher than the base case) but drops to a mid-term level that is 11% lower than the base case.

I have considered the base case forecast and these alternative harvest flows in my determination.

(c) the nature, production capabilities and timber requirements of established and proposed timber processing facilities;

This section of the *Forest Act* was repealed in 2003. [2003-31-2 (B.C. Reg. 401/2003)]

(d) the economic and social objectives of the government, as expressed by the minister, for the area, for the general region and for British Columbia;

Minister's letter and memorandum

The Minister has expressed the economic and social objectives of the Crown for the province in two documents to the chief forester—a letter dated July 28, 1994 (attached as Appendix 3) and a memorandum dated February 26, 1996 (attached as Appendix 4).

This letter and memorandum provide a government view on forest stewardship, a stable timber supply, and allowance of time for communities to adjust to harvest-level changes in a managed transition from old-growth to second-growth forests, so as to provide for community stability.

The Minister stated in his letter of July 28, 1994, that 'any decreases in allowable cut at this time should be no larger than are necessary to avoid compromising long-run sustainability.' He placed particular emphasis on the importance of long-term community stability and the continued availability of good forest jobs. To this end he asked that the chief forester consider the potential impacts on timber supply of commercial thinning and harvesting in previously uneconomical areas in order to help maintain harvest levels. To encourage this, the Minister suggested consideration of partitioned AACs.

I reviewed commercial thinning under *incremental silviculture;* BCFS staff note that only a commercial thinning pilot study has occurred in the TSA since the last determination and none was assumed in the timber supply analysis. I have reviewed the operability assumptions in the timber supply analysis under *inoperable areas and unstable terrain.* I am satisfied that they are based on the best information currently available. The timber supply analysis demonstrates that base case harvest levels can be maintained in the short-term without commercial thinning or harvesting in previously uneconomic areas. Given this information, I see no helpful reason to establish specific harvest levels attributable to particular areas, species, or terrains (i.e. partition) in this TSA at this time to address commercial thinning and previously uneconomic (inoperable) areas. I do address, however, the need for continuation of a partition for small scale salvage and the need for a new partition for deciduous volumes in my "Reasons for Decision" for other purposes.

The Minister's memorandum addressed the effects of visual resource management on timber supply, asking that the constraints applied to timber supply to meet VQOs not be allowed to unreasonably restrict timber supply. As noted in *scenic areas,* the timber supply analysis addressed the timber supply impacts from visual resource management by following standard procedures developed for timber supply review. These procedures were developed in consideration of the Minister's memorandum. I am therefore satisfied this approach addresses the objectives expressed by the minister.

Local objectives

The Minister's letter of July 28, 1994, suggests that the chief forester should consider important social and economic objectives that may be derived from the public input in the timber supply review where these are consistent with government's broader objectives.

Local objectives for land and resource use in the Okanagan TSA are largely captured in the Cabinet approved Okanagan Shuswap LRMP (see *land and resource management plan*). I have accounted as these objectives relate to various factors that I have considered in my determination.

The *Urgent timber supply review for the Okanagan timber supply area Public Discussion Paper* released in July 2005 resulted in a number of public comments, concerns and questions. District staff shared with me the many comments received including those from First Nations that I discussed earlier under *First Nations considerations*. I have taken these many comments into account in my determination as they relate to the various factors that I have considered.

(e) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area.

Forest health

Several biotic and abiotic factors affect forest health in the Okanagan TSA. Forest stands are susceptible to a variety of damaging agents including wildfires, windthrow, disease and insects. Timber volume losses due to insects and diseases that normally effect stands (endemic losses) are generally measured and accounted for in the forest inventory and growth and yield estimates. Modified managed stand yield tables for select analysis units were used to account for root rot as previously discussed. Volumes lost due to abnormal events (epidemic losses) are addressed below under *unsalvaged losses*.

Infestations other than the mountain pine bark beetle epidemic, which I discuss later, include a balsam bark beetle outbreak which affects about a 33 000 hectare area of high elevations spruce/fir stands. Although losses are not minor, indications are that, relative to the pine beetle, a smaller component of the stand is affected and the balsam beetle will not spread that rapidly. Spruce beetle activity exists in one large area in the southern portion of the TSA, and fir beetle activity exists in smaller pockets but appears to be receding.

Unsalvaged losses

Unsalvaged losses are timber volumes destroyed or damaged, by such agents as fire or disease, that are not recovered through salvage operations. Estimates for unsalvaged losses account for epidemic (abnormal) infestations and for factors that result in losses that are not recovered through salvage harvest programs and are not recognized in yield estimates. Timber volume losses due to insects and diseases that normally affect stands (endemic losses) are accounted for in inventory sampling for existing timber yield

estimation or through other methods. Endemic losses associated with second-growth stands are addressed by application of operational adjustment factors (OAFs) as noted under *volume estimates for regenerated managed stands.*

The Okanagan TSA is well positioned to salvage many significant losses due to biotic and abiotic forest health factors given that it has an extensive road network and highly operable terrain, as well as the presence of major licensees and small scale salvage operators who have had a history of salvaging potential losses. Nevertheless, some unsalvaged losses do occur and these dead trees can provide valuable functions across the forest landscape.

The timber supply analysis assumed annual non-recoverable losses of 74 510 cubic metres per year based on an estimated of recent averages and these losses were subtracted from the total harvest flow. The annual losses are based on an estimated 39 525 cubic metres due to fire, 25 425 cubic metres due to insects such as balsam bark beetles, and 9560 cubic metres due to windthrow. Estimated losses due to fire and other factors are averages and reflect wide variations that can and do occur from year to year.

With the exception of the *mountain pine beetle epidemic* (discussed below), unsalvaged losses are based on the best available information at the time the analysis was undertaken. I am satisfied that for the purposes of this determination that the base case has adequately accounted for unsalvaged losses except those related to the mountain pine beetle which I address later.

Small scale salvage

The focus of small scale salvage in the Okanagan TSA is on the recovery of dead timber that would otherwise not be recovered by major licensees and on improving forest health. In the last determination, an 80 000 cubic metre partition was established to support small scale salvage. Qualifying timber was defined as dead trees or trees that will not survive as a result of windthrow and/or insect attack, with recognition of the need for access to necessary amounts of live and merchantable timber required for safety, and also included a specified maximum volume constraint.

BCFS district staff report that the partition has been beneficial in helping to ensure that small scale salvage operations are able to play a complimentarily role in addressing forest health losses in situations where major salvage operations are not warranted. Since the last determination, due to changes in legislation, the BCFS is now often issuing sales up to 2000 cubic metres for small scale salvage in the province. District staff therefore request that the maximum volume constraint associated with the partition be removed.

As a consequence of this feedback, I address the continuation of the partition for small scale salvage in my "Reasons for Decision" with the removal of the maximum volume constraints that were previously in place for qualifying timber.

Mountain pine beetle epidemic

Mountain pine beetles are part of the natural process in lodgepole pine ecosystems. However, the current provincial outbreak has reached an unprecedented level in BC's

history of recording such events. The 2004 annual aerial overview survey indicates that over 7 million hectares of the province are affected including about 4 million hectares in the Southern Interior Forest Region. An immediate collapse to the beetle infestation does not appear likely since the recent trend of warm winters is expected to continue. BCFS staff project that by 2006, 50% of the lodgepole pine volume in the BC's interior will be affected. This huge pine mortality affects available timber supply and habitat, and associated economic and environmental values.

The impacts of rapid expansion of the mountain pine beetle in other parts of the province underscore the probability that a similar situation is developing in the Okanagan TSA. In 2003, an aerial survey in the TSA mapped 10 500 hectares of pine-infested forests. The 2004 aerial survey identified an unprecedented increase in beetle populations with 44 000 hectares of infestation; this represents a four-fold expansion in just one year. The mountain pine beetle spreads by taking flight in the summer. Preliminary results from the 2005 aerial survey indicate the infestation has increased to about 78 000 hectares affected.

While forests in the TSA are relatively diverse, pine still represents 57 million cubic metres or 29% of the total volume in the timber harvesting land base. The vast majority of that pine volume – 55 million cubic metres (or 96% of total pine volume) resides in mature (greater than 60 years old) pine that is most susceptible to the emerging beetle epidemic in the TSA.

Forest health survey in 2004 indicates about 2.7 million cubic metres of pine have been killed by the beetle. If one assumes that the beetle infestation in the TSA stops today and beetle-killed wood is usable as sawlogs for 5 years (i.e. the shelf life), then there would be no need to increase the AAC. Harvesting at the current level would be sufficient to recover the volume from affected stands in less than 5 years. However, an immediate halt to the beetle infestation is not likely.

In an effort to slow the likely inevitable advance of the beetle, to allow a greater chance to recover losses by delaying pine mortality, and to also reduce the negative impacts of the infestation on biodiversity and other values, the Okanagan Shuswap Forest District has developed a comprehensive *Mountain Pine Beetle Management Strategy*. The Strategy focuses harvests in pine leading stands currently with >10% beetle attack and in stands with 30-50% pine with >10% beetle attack where aggressive action is believed necessary to help slow or delay the spread of the infestation. This allows more time to help ensure salvage operations are both possible (i.e. within the shelf-life to recover) and are done in a more orderly way.

If the beetle populations continue to expand as predicted in recent modelling work conducted by the BCFS, there could be as much as 50 million cubic metres of pine volume in a 200 000 hectare area under attack by 2010 of which 21 million cubic metres will be dead. By 2015 the model predicts pine mortality to increase to 37 million cubic metres. These mortality figures are the volume expected to be killed from the beetle infestation if no harvesting occurs. Harvesting enables some of this projected dead wood to be removed prior to infestation or death of the individual trees.

To address this expected epidemic for the purposes of this urgent timber supply review, mountain pine beetle (MPB) scenarios were developed for public review and consideration in support of this determination. The following key assumptions differed from the base case and were applied to each scenario:

- Inventory files were updated in the TSA to reflect recent harvesting to 2004 and the ages of unharvested stands was increased by 5 years to reflect current age;
- Stands initially targeted for harvest are expected to have over 50% mortality by volume by 2010 or 2015 (referred to as "very severely" attacked stands) with lower-attack stands targeted later;
- At least 74% of the harvest profile in the TSA is directed at targeted pine stands;
- Landscape- and stand-level retention in targeted stands is increased to 20% given the expected larger openings; this level is assumed to be 6% higher than the base case (given provisions in the base case for retention of old growth, wildlife tree patches and riparian reserves);
- The forest cover constraints in the IRM zone (i.e. maximum of 30% of stands permitted below 2 metres in height) are removed; and
- All other forest cover requirements for non-timber values (e.g. for wildlife, community watersheds, etc.) continue except for a relaxation of maximum disturbance constraints in scenic areas where the VQO could change by one class.

It was also assumed that:

- Very severely attacked pine stands that are not harvested for any reason will experience a 15-year regeneration delay and will develop as unmanaged stands; and
- Unharvested stands projected to be in severe (31-50% mortality), moderate (11-30% mortality) or low (1-10%) attack classes with respect to beetle attack are placed on new yield curves with volume reductions to account for pine loss.

Of the 5 scenarios developed and described to me in detail, three are described here as they factored most heavily in my determination: (1) MPB 2010 scenario; (2) MPB 2010 with one million uplift scenario; and (3) MPB 2015 scenario. The years refer to specific points in the BCFS beetle projection model; in all scenarios a 5-year shelf-life to economically recover affected stands is assumed.

Very severely affected stands refer to those stands that are projected to have greater than 50% mortality based on the predictive modelling work for that scenario year; these stands averaged 89% pine. Severely affected stands are projected to have 31-50% mortality and average 78% pine. Both very severe and severely affected stands are pine-leading with a substantial pine component.

The *MPB 2010 scenario* explores the impact of targeting very severely affected stands for the first 5 years (2005-2010). In this scenario, an initial 5-year harvest level of 3 224 000 cubic metres is needed which drops to 3 000 000 cubic metres over the

subsequent 5-year period. After 2015, harvest levels need to continue to drop to a mid-term level which is reached earlier (but is slightly higher) than in the base case.

In this scenario, all of the projected 11.5 million cubic metres of pine mortality in very severely attacked stands is salvaged, however very little of the pine in the other severity classes are recovered leading to a total unsalvaged loss of about 9.4 million cubic metres.

The *MPB 2010 with one million uplift scenario* tests the impact of harvesting all stands predicted to be very severely attacked by 2010 as well as harvesting of some severely impacted stands during the first 5 years. An initial 5-year harvest level is set at 3 655 000 cubic metres and then is set to drop to 3 000 000 cubic metres over the subsequent 5-year period. After 2015, harvest levels continue to drop to a mid-term level which is reached earlier than (and is similar to) the base case.

In this scenario, in addition to recovering pine mortality in very severely attacked stands, some salvage is also possible in severely attacked stands. Total recovered mortality is projected to be about 12.4 million cubic metres with about 8.5 million cubic metres of unsalvaged losses.

The *MPB 2015 scenario* tests the impact of harvesting all stands predicted to be very severely attacked by 2015. To accomplish this, the initial harvest level would need to be set at 3 685 000 cubic metres for 10 years and then is set to drop to 3 000 000 cubic metres (as with other scenarios). After 2015, harvest levels continue to drop to a mid-term level which is reached earlier than (and is similar to) the base case.

In this scenario, total pine mortality is projected to be about 37 million cubic metres (versus about 21 million in the 2010 scenarios) due to the assumed continuation of the epidemic to 2015. This scenario recovers about 28.5 million cubic metres of projected pine mortality leaving about 8.9 million cubic metres as unsalvaged losses.

In reviewing all of the information about the mountain pine beetle epidemic, including the scenarios that were provided, I conclude that a substantial uplift above the current AAC will be required to address the expected unprecedented expansion of beetle populations in the TSA. However, I am also mindful of the importance of conserving non-pine volumes as much as possible in order to reduce potential impacts on harvest volumes, and associated economic impacts, on the TSA in the mid-term, as well as the need to retain non-pine for various environmental purposes.

Very severely attacked stands are projected to have greater than 50% stand mortality and the *MPB 2010 scenario* targets all these stands. However there is no allowance in this scenario to harvest either (a) some severely attacked stands (with 31-50% mortality) or (b) some stands with >10% attack that the Okanagan Shuswap Forest District's *Mountain Pine Beetle Management Strategy* has identified as needed to delay the projected spread of beetle populations by aggressively harvesting some of these infested stands.

The *MPB 2010 with a one million uplift scenario* allows for harvesting all of the stands projected to be very severely attacked and about 20% of the volume in stands projected to be severely attacked. However, I am concerned that this level of harvest could inappropriately deplete a significant component of these stands that are not projected to suffer mortality losses that may be needed to support mid-term harvest levels. Although

the harvest projection for this scenario suggests a mid-term level can be maintained similar to the base case, there are a number of uncertainties in model projections (which I discuss throughout this document) which could cause risk to achievement of projected mid-term levels. Leaving as much of the non-pine component of stands unharvested as possible, where not directly needed to achieve the forest district's MPB Management Strategy, will be important to help ensure mid-term levels in fact can be achieved.

In my "Reasons for Decision", I believe a point between the *MPB 2010 scenario* and the *MPB 2010 with a one million uplift scenario* represents an appropriate uplift as it targets all projected very severely attacked stands to ensure high mortality losses are recovered and areas are reforested, while also allowing additional volume to better enable the district to implement their MPB strategy with focus on projected severely attacked stands. Where stands with 30-50% pine are harvested to meet the forest district's MPB strategy, the non-pine component should be retained as much as feasibly possible to help support future harvest volumes needed in the mid-term and to help attain the increased levels of retention for biodiversity.

The *MPB 2010 scenario* and the *MPB 2010 with a one million uplift scenario* project 9.4 million and 8.5 million, respectively, in unsalvaged losses. Based on these projections, I recognize that my decision could result in unsalvaged losses of about 9.1 million cubic metres – about 0.6 million cubic metres more than the *MPB 2010 with a one million uplift scenario*. I nevertheless believe my decision is prudent because of the concerns I have expressed above about this scenario's potential impacts on mid-term timber supply.

My decision is predicated on scenarios projecting the beetle outbreak to 2010 in the TSA. Based on new information such as future aerial surveys, if projections show that the beetle will likely to continue to progress to 2015, thereby resulting in a larger area of very severely attacked stands, I am prepared to revisit this determination and reassess this decision.

Reasons for Decision

In reaching my AAC determination for the Okanagan TSA, I have made all of the considerations documented above and have reasoned from them as follows.

The 2003 timber supply analysis base case projection indicates an initial harvest level of 3 000 000 cubic metres per year can be maintained for four decades. After that, harvest levels decline by approximately 8% per decade for two decades before reaching a mid-term harvest level of 2 555 000 cubic metres per year which can be maintained from decades 6 to 10. Harvest levels can then increase 15% in decade 11 to a sustained long-term level of 2 930 000 cubic metres.

In determining AACs, my considerations typically identify factors which, considered separately, indicate reasons why the timber supply may be either greater or less than the harvest levels projected for various periods in the base case. Some of these factors can be quantified and their implications assessed with reliability. Others may influence the assessment of the timber supply by introducing an element of risk or uncertainty, but

cannot be quantified reliably at the time of the determination and must be accounted for in more general terms.

In my considerations, the following factors have been identified as reasons why the timber supply projected in the base case may have been overestimated:

- *Woodlots*: new and committed woodlot volumes are no longer part of the TSA and I therefore recognize a downward pressure of 22 016 cubic metres throughout the harvest forecast horizon.
- *Community forests*: a new community forest was established and this area is no longer part of the TSA; I therefore recognize the expected volumes associated with this tenure, or 58 850 cubic metres (i.e. 55 000 cubic metre harvest volume x 1.07 inventory volume adjustment), to be a downward pressure on timber supply throughout the harvest forecast horizon.
- *Archaeological and cultural heritage resources:* the extent of forest harvesting in identified sacred areas is uncertain in order to respect their spiritual values for First Nations. I therefore recognize an uncertain downward pressure of less than 0.8%; 0.8% representing the percent of the TSA's timber harvesting land base estimated to be in identified sacred areas. For the purposes of tracking cumulative downward pressures I assume roughly a 14 000 cubic metre downward pressure on timber supply throughout the harvest forecast horizon.
- *Deer winter range:* the generalized modelling of deer winter range appears to have resulted in a 2% downward pressure on timber supply in the mid-term and a 1% downward pressure in the long-term.

The first three factors represent an estimated cumulative downward pressure of 94 866 cubic metres or about 95 000 cubic metres relative to the base case in the short-term.

The following factor has been identified as reason why the timber supply projected in the base case could be higher:

- *Deciduous volumes:* the base case assumed no contribution from deciduous volumes in coniferous-leading stands within the TSA, yet there is a bona fide demand for these volumes where they are not needed to meet other forest management objectives. I conclude that the short-term timber supply could be increased by 20 000 cubic metres based on my review of this factor.

After taking this increase in timber supply into account, the net reduction of the base case timber supply in the short term is 75 000 cubic metres.

After carefully examining each of the relevant factors under section 8 of the *Forest Act* for the Okanagan TSA, the assumptions made in deriving the base case harvest projection in the timber supply analysis, and factors that may have over- or under-estimated timber supply in the short-, mid- and long-term, it is my determination that a "base" AAC of 2 925 000 cubic metres can be supported in the TSA. This new "base" AAC is 270 000 cubic metres above the current AAC. As much as possible of the

2 925 000 cubic metre needs to be directed at pine stands projected to be very severely attacked consistent with the MPB 2010 scenario.

In addition to the "base" AAC, an additional uplift for 5 years to address the mountain pine beetle epidemic is needed in the Okanagan TSA.

Under the *MPB 2010 scenario*, a 5-year uplift of 569 000 cubic metres (i.e. 3 224 000 cubic metres relative to the current AAC of 2 655 000 cubic metres) enabled stands projected to be very severely attacked in 2010 to be harvested where not needed to meet forest management constraints for non-timber values. However, this uplift level will not provide sufficient volume to harvest either: (a) some severely attacked stands (with 30-50% mortality) or (b) some stands with 30-50% pine and >10% attack that the Okanagan Shuswap Forest District's *Mountain Pine Beetle Management Strategy* has identified as needed to delay the projected spread of beetle populations by aggressively harvesting some of these infested stands.

Under the *MPB 2010 with a one million uplift scenario*, a 5-year uplift of 1 000 000 cubic metres (i.e. 3 655 000 cubic metres relative to the 2 655 000 current AAC) enabled all available very severely attacked stands to be harvested and also enabled harvesting in about 20% of those stands projected to be severely attacked by 2010. However, I am concerned that this level of harvest could inappropriately deplete the component of these stands that are not projected to suffer mortality losses and that may be needed to support mid-term harvest levels.

I believe a point at 700 000 cubic metres above the current AAC represents an appropriate uplift as it enables all stands projected to be very severely attacked by 2010 to be harvested to help ensure high mortality losses are recovered and these areas are reforested, while also allowing additional volume to better enable the district to implement their MPB strategy with some harvest focused on stands projected to be severely attacked by 2010. Where low mortality stands are harvested to meet the MPB strategy, the non-pine component should be retained as much as feasibly possible to help support future harvest volumes needed in the mid-term and to help attain the increased levels of retention for biodiversity.

Therefore the total coniferous AAC I have determined for the Okanagan TSA for the next 5 years is 3 355 000 cubic metres. This is a 5-year beetle uplift of 700 000 cubic metres above the current AAC.

My decision is predicated on scenarios projecting the beetle infestation in the TSA to 2010. Based on new information such as future aerial surveys, if projections show that the beetle is likely to continue to progress to 2015, thereby resulting in a larger area of very severely attacked stands, I am prepared to revisit this determination and reassess this decision.

I also recognize in my decision that the increased timber supply represented by the 20 000 cubic metres of deciduous volume should be tracked in a new partition to address deciduous volumes that are recovered and utilized when harvesting coniferous-leading stands and when not needed for retention purposes. Therefore, the total AAC for the Okanagan TSA is determined to be 3 375 000 cubic metres.

The new AAC also includes the continuation of the existing 80 000 cubic metre partition for small scale salvage with qualifying timber as defined in the last determination with removal of maximum volume constraints. The partition does not limit small scale salvage to 80 000 cubic metres, particularly in light of the need for a variety of salvage efforts to address the mountain pine beetle, but does continue the enabling provisions in the previous AAC for these important minor salvage efforts.

The Okanagan Innovative Forestry Society (OIFS) were responsible for timber supply analysis used to help support this determination. They deserve a great deal of credit for their efforts. The base case assumptions were well-reasoned, and the sensitivity analyses provided the information I needed to assess the potential implications of uncertainties.

I also greatly appreciate the considerable efforts of Okanagan Shuswap Forest District, Southern Interior Forest Region, Forest Analysis and Inventory Branch and other BCFS and agency staff for their considerable efforts in support of this determination. They provided me with the information and analysis I needed to make this determination.

Considerable efforts were made in this urgent timber supply review to obtain public and First Nations feedback and several comments were received. I appreciate the valuable feedback that I received from First Nations and the public under relatively short notice. These comments were an important consideration that I took into account in my determination.

Determination

I have considered and reviewed all the factors as documented above, including the risks and uncertainties in the information provided. It is my determination that a timber harvest level that accommodates objectives for all forest resources during the next five years and that reflects current management practices as well as the socio-economic objectives of the Crown, and the need to address the mountain pine beetle epidemic can be best achieved in the TSA by establishing an AAC of 3 375 000 cubic metres.

Within this total AAC of 3 375 000 cubic metres, a partition of 80 000 cubic metres is continued for small scale salvage, and a new partition of 20 000 cubic metres is provided for deciduous volumes.

This determination is effective January 1, 2006, and will remain in effect until a new AAC is determined, which must take place within five years of the effective date of this determination.

If additional significant new information is made available to me, major changes occur in the management assumptions upon which I have predicated this decision, or the mountain pine beetle outbreak progresses significantly differently than assumed in support of this decision, then I am prepared to revisit this determination sooner than the five year limit required by legislation.

Implementation

In the period following this decision and leading to the subsequent determination, I encourage BCFS staff and licensees to undertake the tasks and studies noted below that I have also described further in the appropriate sections of this rationale document. I recognize that the ability of staff and licensees to undertake these projects is dependent on available resources including funding. These projects are, however, important to help reduce the risk and uncertainty associated with key factors that affect the timber supply in the Okanagan TSA.

- *Roads, trails and landings:* the assumptions used to estimate existing and future losses due to roads, trails and landings needs to be refined given the uncertainty raised in the timber supply analysis about how this factor was assessed;
- *Inoperable areas and unstable terrain:* current operability lines that have been reconciled with older (Es) mapping for unstable soils should be assessed relative to the more recent terrain stability mapping so that the lines can be confirmed or adjusted where warranted;
- *Controlled recreation area:* controlled recreation areas are being negotiated in support of BC's all-season resort strategy and when established their impact on timber supply on the TSA should be assessed and tracked;
- *Existing forest inventory*: the Okanagan TSA has one of the oldest forest inventories in the province; VRI phase 1 re-inventory work needs to be completed given the age of the existing forest inventory;
- *Genetic worth:* because of uncertainty regarding the level of deployment of select seed in planting operations in the TSA, the Reporting Silviculture Updates and Landstatus Tracking System (RESULTS) data base should be reviewed to assess actual use of select seed; and
- *Regeneration delay:* the assumed 2-year regeneration delay in the timber supply analysis may be optimistic given apparent increased reliance on natural regeneration in the TSA which normally results in longer delays; RESULTS data should be reviewed to better assess regeneration delay.

Jim Snetsinger
Chief Forester

December 05, 2005

Appendix 1: Section 8 of the *Forest Act*

Section 8 of the *Forest Act*, Revised Statutes of British Columbia 1996, c. 157 Consolidated to October 21, 2004, reads as follows:

Allowable annual cut

8 (1) The chief forester must determine an allowable annual cut at least once every 5 years after the date of the last determination, for

(a) the Crown land in each timber supply area, excluding tree farm licence areas, community forest areas and woodlot licence areas, and

(b) each tree farm licence area.

(2) If the minister

(a) makes an order under section 7 (b) respecting a timber supply area, or

(b) amends or enters into a tree farm licence to accomplish the result set out under section 39 (2) or (3),

the chief forester must make an allowable annual cut determination under subsection (1) for the timber supply area or tree farm licence area

(c) within 5 years after the order under paragraph (a) or the amendment or entering into under paragraph (b), and

(d) after the determination under paragraph (c), at least once every 5 years after the date of the last determination.

(3) If

(a) the allowable annual cut for the tree farm licence area is reduced under section 9 (3), and

(b) the chief forester subsequently determines, under subsection (1) of this section, the allowable annual cut for the tree farm licence area,

the chief forester must determine an allowable annual cut at least once every 5 years from the date the allowable annual cut under subsection (1) of this section is effective under section 9 (6).

(3.1) If, in respect of the allowable annual cut for a timber supply area or tree farm licence area, the chief forester considers that the allowable annual cut that was determined under subsection (1) is not likely to be changed significantly with a new determination, then, despite subsections (1) to (3), the chief forester

(a) by written order may postpone the next determination under subsection (1) to a date that is up to 10 years after the date of the relevant last determination, and

(b) must give written reasons for the postponement.

(3.2) If the chief forester, having made an order under subsection (3.1), considers that because of changed circumstances the allowable annual cut that was determined under subsection (1) for a timber supply area or tree farm licence area is likely to be changed significantly with a new determination, he or she

(a) by written order may rescind the order made under subsection (3.1) and set an earlier date for the next determination under subsection (1), and

(b) must give written reasons for setting the earlier date.

(4) If the allowable annual cut for the tree farm licence area is reduced under section 9 (3), the chief forester is not required to make the determination under subsection (1) of this section at the times set out in subsection (1) or (2) (c) or (d), but must make that determination within one year after the chief forester determines that the holder is in compliance with section 9 (2).

(5) In determining an allowable annual cut under subsection (1) the chief forester may specify portions of the allowable annual cut attributable to

(a) different types of timber and terrain in different parts of Crown land within a timber supply area or tree farm licence area, and

(b) different types of timber and terrain in different parts of private land within a tree farm licence area,

(c) [Repealed 1999-10-1.]

(6) The regional manager or district manager must determine an allowable annual cut for each woodlot licence area, according to the licence.

(7) The regional manager or the regional manager's designate must determine a an allowable annual cut for each community forest agreement area, in accordance with

(a) the community forest agreement, and

(b) any directions of the chief forester.

(8) In determining an allowable annual cut under subsection (1) the chief forester, despite anything to the contrary in an agreement listed in section 12, must consider

(a) the rate of timber production that may be sustained on the area, taking into account

(i) the composition of the forest and its expected rate of growth on the area,

(ii) the expected time that it will take the forest to become re-established on the area following denudation,

(iii) silviculture treatments to be applied to the area,

(iv) the standard of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area,

(v) the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production, and

(vi) any other information that, in the chief forester's opinion, relates to the capability of the area to produce timber,

(b) the short and long term implications to British Columbia of alternative rates of timber harvesting from the area,

(c) Repealed [2003-31-02]

(d) the economic and social objectives of the government, as expressed by the minister, for the area, for the general region and for British Columbia, and

(e) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area.

Appendix 2: Section 4 of the *Ministry of Forests Act*

Section 4 of the *Ministry of Forests Act* (consolidated 1988) reads as follows:

Purposes and functions of ministry

4. The purposes and functions of the ministry are, under the direction of the minister, to

(a) encourage maximum productivity of the forest and range resources in British Columbia;
(b) manage, protect and conserve the forest and range resources of the government, having regard to the immediate and long term economic and social benefits they may confer on British Columbia;
(c) plan the use of the forest and range resources of the government, so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are co-ordinated and integrated, in consultation and co-operation with other ministries and agencies of the government and with the private sector;
(d) encourage a vigorous, efficient and world competitive timber processing industry in British Columbia; and
(e) assert the financial interest of the government in its forest and range resources in a systematic and equitable manner.

Documents attached:

Appendix 3: Minister's letter of July 28, 1994

Appendix 4: Minister's memo of February 26, 1996

File: 10100-01

JUL 28 1994

John Cuthbert
Chief Forester
Ministry of Forests
595 Pandora Avenue
Victoria, British Columbia
V8W 3E7

Dear John Cuthbert:

Re: Economic and Social Objectives of the Crown

The *Forest Act* gives you the clear responsibility for determining Allowable Annual Cuts, decisions with far-reaching implications for the province's economy. The *Forest Act* provides that you consider the social and economic objectives of the Crown, as expressed by me, in making these determinations. The purpose of this letter is to provide this information to you.

The social and economic objectives expressed below should be considered in conjunction with environmental considerations as reflected in the Forest Practices Code, which requires recognition and better protection of non-timber values such as biodiversity, wildlife and water quality.

The government's general social and economic objectives for the forest sector are made clear in the goals of the Forest Renewal Program. In relation to the Allowable Annual Cut determinations you must make, I would emphasize the particular importance the government attaches to the continued availability of good forest jobs and to the long-term stability of communities that rely on forests.

Through the Forest Renewal Plan, the government is taking the steps necessary to facilitate the transition to more value-based management in the forest and the forest sector. We feel that adjustment costs should be minimized wherever possible, and to this end, any decreases in allowable cut at this time should be no larger than are necessary to avoid compromising long-run sustainability.

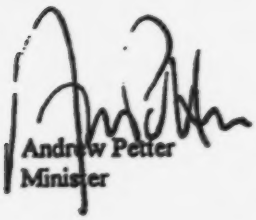
.../2

Province of British Columbia
Minister of Forests
Parliament Buildings
Victoria, British Columbia
V8V 1X4

In addition to the provincial perspective, you should also consider important local social and economic objectives that may be derived from the public input on the Timber Supply Review discussion papers where these are consistent with the government's broader objectives.

Finally, I would note that improving economic conditions may make it possible to harvest timber which has typically not been used in the past. For example, use of wood from commercial thinnings and previously uneconomic areas may assist in maintaining harvests without violating forest practices constraints. I urge you to consider all available vehicles, such as partitioned cuts, which could provide the forest industry with the opportunity and incentive to demonstrate their ability to utilize such timber resources.

Yours truly,



Andrew Petter
Minister

Province of British Columbia
Ministry of Forests
OFFICE OF THE MINISTER

MEMORANDUM

File: 16290-01

February 26, 1996

To: Larry Pedersen
Chief Forester

From: The Honourable Andrew Petter
Minister of Forests

Re: **The Crown's Economic And Social Objectives Regarding Visual Resources**

Further to my letter of July 29, 1994, to your predecessor, wherein I expressed the economic and social objectives of the Crown in accordance with Section 7 of the *Forest Act*, I would like to elaborate upon these objectives as they relate to visual resources.

British Columbia's scenic landscapes are a part of its heritage and a resource base underlying much of its tourism industry. They also provide timber supplies that are of significant economic and social importance to forest industry dependent communities.

Accordingly, one of the Crown's objectives is to ensure an appropriate balance within timber supply areas and tree farm licence areas between protecting visual resources and minimizing the impact of such protection measures on timber supplies.

As you know, I have directed that the policy on management of scenic landscapes should be modified in light of the beneficial effects of the Forest Practices Code. In general, the new policy should ensure that establishment and administration of visual quality objectives is less restrictive on timber harvesting. This change is possible because alternative harvesting approaches as well as overall improvement in forest practices will result in reduced detrimental impacts on visually sensitive areas. Also, I anticipate that the Forest Practices Code will lead to a greater public awareness that forest harvesting is being conducted in a responsible, environmentally sound manner, and therefore to a decreased public reaction to its visible effects on the landscape. In relation to the Allowable Annual Cuts determinations that you make, please consider the effects that the new policy will have in each Timber Supply Area and Tree Farm Licence.

.../2

In keeping with my earlier letter, I would re-emphasize the Crown's objectives to ensure community stability and minimize adjustment costs as the forest sector moves to more value-based management. I believe that the appropriate balance between timber and visual resources will be achieved if decisions are made consistent with the ministry's February 1996 report *The Forest Practices Code: Timber Supply Analysis*.

Finally, in my previous letter I had asked that local economic and social objectives be considered. Please ensure that local views on the balance between timber and visual resources are taken into account within the context of government's broader objectives.

Andrew Petter
Minister of Forests

Appendix 5: List of Submissions and Responses Received

First Nations*

Adams Lake Indian Band
Little Shuswap Indian Band
Lower Similkameen Indian Band
Okanagan Indian Band
Okanagan Nation Alliance (Sylix Nation)
Neskonlith Indian Band
Penticton Indian Band
Shuswap Nation Tribal Council (Secwepemc Nation)
Spallumcheen Indian Band
Upper Similkameen Indian Band
Westbank Indian Band

*includes attendees at meetings

Also contacted:
Osoyoos Indian Band
Upper Nicola Indian Band

Public

BC Independent Sawmills
Forestry Online
Guide Outfitters Association of BC
Shuswap Environmental Action Society
Shuswap Okanagan Forest Association
Two comments from individuals

Agency staff

Ministry of Forests and Range
Ministry of Environment
Ministry of Agriculture and Lands